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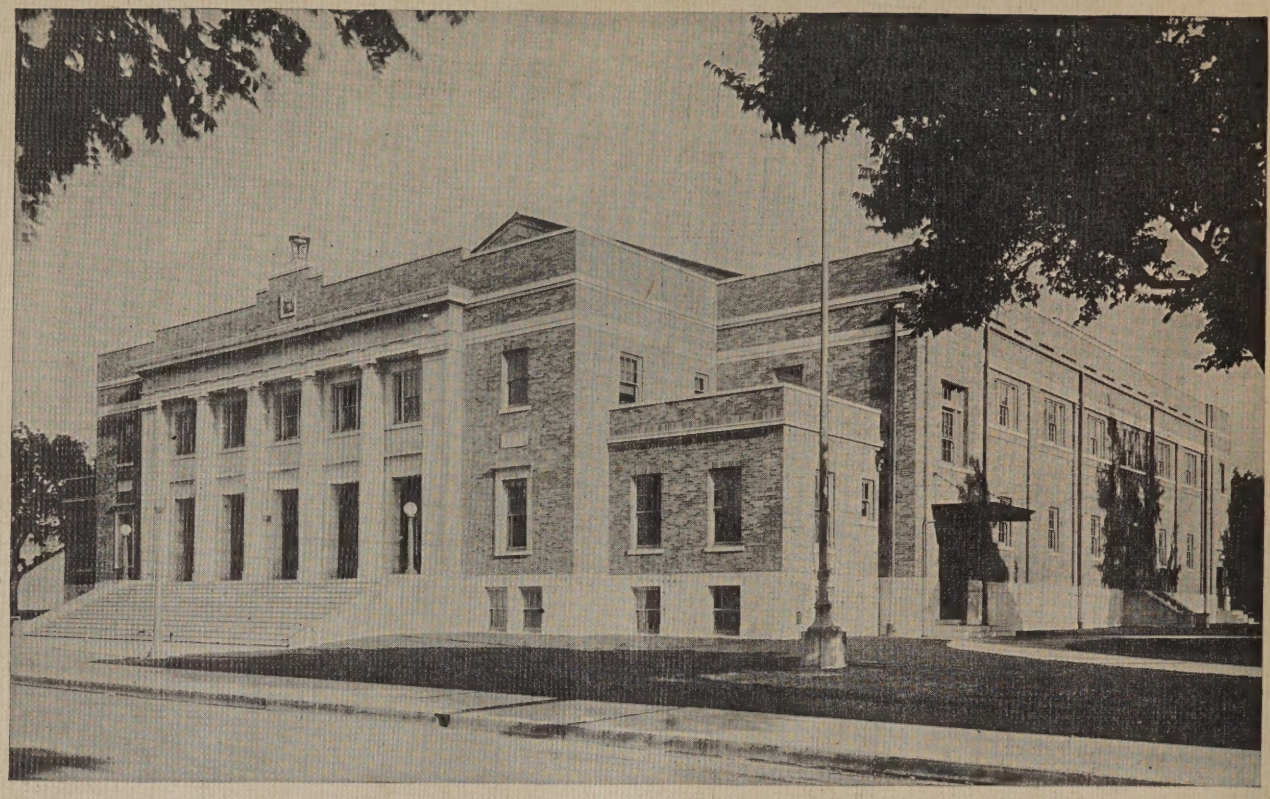

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BOOK DEPARTMENT

SOME OLD PLANTATION HOUSES IN LOUISIANA

A Review by
WALTER F. WHEELER

WHAT is left of the architectural heritage of southern Louisiana represents but a small portion of the legacy of a highly colored and richly historical past. "The city," as New Orleans is even yet referred to throughout Louisiana, was after all but the center of this colorful life, for on vast plantations on the "Upper Coast" or the "Lower," on the shores of Lake Ponchartrain or along the languid and sluggish Teche the descendants of the early French and Spanish aristocracy cultivated their broad and fertile acres with the aid of willing blacks and perpetuated in not a few instances the traditions of a much older civilization, sometimes giving their plantations names,—such a name as "Fontainebleau," for example,—which of themselves suggested a certain glamour and exerted a definite appeal. But at the same time there is probably no section of the entire country which has suffered more cruelly from the vicissitudes of time. Storm and tornado have more than once devastated the region, as have disastrous floods without number, and within the past few months the world has watched, with dismay, the work of the most recent flood and the sacrifice of a large part of Louisiana in an attempt to secure the safety of "the city,"—none too secure even behind its supposedly impregnable "levees." The attempt to save New Orleans must have involved the destruction of many an old plantation house, the loss of which leaves American architecture definitely the poorer. Fearful indeed was the devastation wrought by the angry Mississippi as it spread over the richest parishes in Louisiana, working ruin as it swept the land, undoing in days work of centuries.

"Oak Lawn" on Bayou Teche

One opens this interesting work, sympathetically written and illustrated with some 50 or more of Mr. Spratling's spirited sketches, wondering just how much of all this architectural and historical riches still exists. Architecturally the fashions of southern Louisiana have always been derived from French and Spanish sources, the resulting fusion being powerfully influenced by the "Greek Revival," for the high tide of the prosperity of the South came just before the period of the Civil War, the time being also that of the culmination of American interest in this particular type. This architectural style was quickly seen to be well adapted for use in Louisiana, for broad and columned verandas or "galleries," whether one story high or two, made bearable the heat of the warmest days, and the floor plan which generally went with this particular type was such as appealed to local habit and custom. Louisiana, in fact, perhaps with more fervor than any other part of the South, embraced the teachings of the "Revival," and the results are still to be seen after 60 or more years of ruthless treatment. In this interesting volume these old plantation homes are presented in their most charming light. One views them as from a public highway, the window of a railroad car, or from the deck of one of the few "steamboats" which still travel the Mississippi,—houses generally low and spreading, of frame or else of brick stuccoed over, generally painted white or whitewashed, and usually having green blinds or shutters at their windows and often at their doors. Such a house will generally be surrounded by many small accessory buildings, and all this will probably be embowered in a grove of magnolias or live oaks, the oaks likely to be heavily draped with the moss which gives to the gayest setting a somewhat funereal appearance.

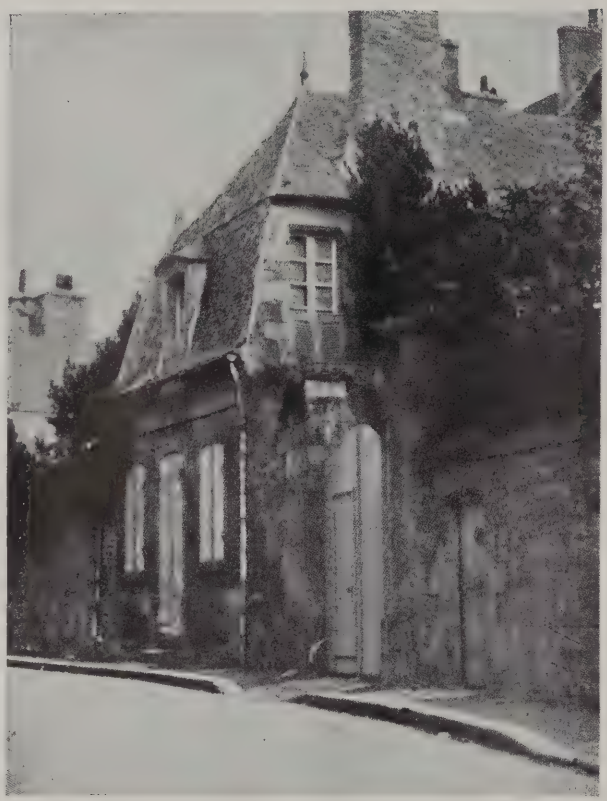
All of this would apply to "Oak Lawn," the old plantation house illustrated on this page. "The romance and gallantries and the large manner of living which is the South of yesterday seem a pleasant, unsubstantial thing. However, places in the manner of Oak Lawn perform a miracle of incarnation, and give form and body and the breath of life to graceful, legendary people. So all the tales often vouched for, but never seeming to have the stuff of truth, acquire a solidity; the banquet with five-dollar bills used as cigar lighters, the wedding gifts of six men slaves and six women slaves, each with a turban full of gold on the head,—to this and all their glittering ilk one is instantly attuned by a view of Oak Lawn as it stands aloof, remote and in picturesque decay.

"A mile or so, with endless stretches of the open fields of cotton and cane, utter calm and hardly a human being in evidence. Then appears an ordered grove of gigantic oaks, and there is the house, massive, beautiful, back in its sheltering trees, proportioned as magnificently as they, its giant white columns gleaming through their gnarled trunks, the immense main house flanked by a wing that is like it but smaller, one of the largest and most important of the old houses in the state, laid out splendidly. Its outbuildings crumble, but the oaks shield them; the Teche lies just beyond. There is an immediate, compelling grandeur about the house itself. One stands in awe of it; instinctively one becomes conscious of a personal smallness before it, almost as before a cathedral. Its dinginess is not apparent from afar, and the im-

French Farm Houses, Small Chateaux and Country Churches

By Antonio di Nardo

With Preface by Paul P. Cret



THE buildings of no country offer more in the way of inspiration for present-day architects than those of France. French towns and villages are filled with fine old houses and shop buildings, and the countryside abounds in farmhouses, farm structures singly or in groups, manor houses large or small, and the rural churches and wayside shrines which are among the most beautiful buildings of their kind in the world. All these structures by reason of their direct and practical designing supply the best possible precedent for modern work.

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pression is superbly imposing, of the great bulk of the house, painted a soft yellow, the openings green, and the rows of white columns gleaming before it, in the jagged revelations of the oaks. Within the line of white columns there is a long, light balcony for the second floor, with its balustrade embroidering the face of the house in heavy wooden patterns. Other little galleries with wrought iron balustrades front the high attic windows of both front and rear gables.

"The wing is a charming building in itself, flanking the house off to the side, and joining to it by a short covered balcony, with steps running down to it from the galleries of the main house. It echoes impeccably the style of the main house, its simple, round, white columns, the type of its openings, its long gallery, with everything on a slightly smaller scale,—and the juxtaposition of the two makes all the more strikingly marked the massively grandiose conception of the place. It is the back of the house that one sees from the road. The front faces the serene tranquility of the bayou, across stretches of lawn, now unkempt, with oaks standing down to the water's edge, and reaching to oaks that are ranged thickly on the other side of the stream. The front is quite like the back. It has a deep main gallery, and lighter balcony and ironwork. There is a fine central door designed with the nobility of scale which the house requires, very wide, with sidelights and fanlights, and in the Greek tradition. Round columns enhance its stateliness. The details of construction are beautiful in every instance. The fanlights particularly are charming; they show an Empire influence in their design, and have little rosettes on the ribs. The broad windows are elliptical at the top, with typical fanlights and heavy shutters.

"Fragments remain of a quaint little old fashioned garden, an oval arc, enclosed in a fence of wrought iron, directly in front of the wide, low central steps, and the garden space is pleasantly rank with cedars, and Japanese plums, crepē myrtle, sweet olive, and roses."

OLD PLANTATION HOUSES IN LOUISIANA. By William P. Spratling and Natalie Scott. 162 pp., 7 x 9¾ ins. Price $5. William Helburn, Inc., 15 East 55th Street, New York.

SHOP FRONTS; A SELECTION OF ENGLISH, AMERICAN AND CONTINENTAL EXAMPLES. Edited by Frederick Chatterton, F. R. I. B. A. 104 pp., 9¾ x 11¾ ins. Price $7.50. Carl Wendelin Kuehny, 3554 Attica Road, Cleveland.

THE past two or three decades have been characterized by the emphasis that has been placed upon advertising and selling as a part of distribution. In a comparatively short time advertising has developed into an important economic science, and it is only natural that show window display, which is an important part of advertising, should be receiving more attention than formerly. In times past it was thought sufficient to have a fine line of goods in a store, and little or no attention was given to attracting the customer inside. If show windows were provided, it was merely as places to put the goods so that more people might see them, and not much attention was given to making the show window treatment harmonize with the rest of the building or to make it express something of the character and quality of the establishment that lay behind it. The study of merchandising has shown how important it is to surround an establishment or line of merchandise with an atmosphere giving an immediate impression of high

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quality, stability or other desirable attributes, and in no way can this be accomplished better than by means of a well designed shop front. It is a realization of this fact that has caused the very evident improvement in the shop fronts of the various cities of the world during the past ten years or so. A collection of illustrations of the best and most representative shop fronts of the world has been made by Frederick Chatterton, and published now in book form. These examples include many interesting shops in various cities of England, and also examples of the best modern work in Paris, Rome, Vienna, Berlin and New York. The volume is a fine record of some of the most attractive fronts of modern times. The illustrations are clear and well chosen and are supplemented in most instances by details or measured drawings showing the actual layout and construction of the windows. A wider variety of treatments would be hard to find, and it is interesting to note how various masters of architecture have achieved the ends they sought, and have provided pleasing and artistic fronts for modern merchandising establishments.

WINNING DESIGNS, Paris Prize in Architecture, Society of Beaux Arts Architects. A portfolio containing text and plates. 10 x 15 inches, with an introduction by John F. Harbeson. Price $6. Pencil Points Press, New York.

PERHAPS no one man has done so much in the interest of American architectural education as the late Lloyd Warren. He was foremost among those who in 1896 established the Society of Beaux Arts Architects in America in order to spread the influence of the Ecole des Beaux Arts of Paris in this country. In the work of organization and development many men gave unsparingly of their time and their effort, but none worked so untiringly as Lloyd Warren. It was he who was responsible for the four achievements which are outstanding in the history of the Society,—the establishment of the Beaux Arts Institute of Design, which included education in mural painting and sculpture as well as in architecture; the organization of the school at Bellevue for men in the American Expeditionary Forces in France through the effort of Mr. Warren and the Beaux Arts Society; and the organization of the summer school at Fontainebleau. The crowning achievement of his career, perhaps, was the establishment of the Paris Prize to be awarded each year, providing study and foreign travel in Europe for its winner. Winning this prize is considered the highest honor that can be attained by any American student; it is most keenly competed for, and its winner is admitted to the Ecole directly to the first class. The success of these competitions has been in a very great measure due to the efforts of Mr. Warren, and it is most fitting that it be carried on as a memorial to him. There have been 20 competitions held for this prize during the period between 1904 and 1927, and their value to the development of American architecture can scarcely be measured. Not only does it furnish the opportunity for broadening travel and study on the part of the student who is clever enough to win the prize but it provides the ultimate goal to be sought by all ambitious students and thus stimulates them to greater effort and in this way has a lasting effect on the work and training of many thousands of American architects. By his keen intelligence, ability for organization and untiring

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The prize-winning designs of the first 20 competitions have been collected and published in portfolio form with a foreword by John F. Harbeson and form a very interesting collection of designs. They are most useful for students of design and architects, as they show the technique of the best draftsmen of all the American students during the past 20 years, and are useful not only for study in connection with competition work but also furnish valuable precedent in actual building. A wide variety of subjects is covered, as is indicated in following the various programs. The first problem was a Colonial Institute, to be located in Washington, where graduate students might study and come in contact with American leaders and institutions. Second competition: a yacht harbor in New York, in connection with headquarters for the three most important yacht clubs. Third competition: a restaurant on the border of a lake. Fourth competition: a school of fine arts to accommodate about 600 students, equally divided between architecture, sculpture and painting. Fifth competition: a theater designed for lyric and dramatic presentation in a large city. Sixth competition: a permanent exposition or institute of American industries, located in Washington, for exhibitions of the products of the various states. Seventh competition: a municipal interurban trolley station and assembly hall. Eighth competition: an embassy for the United States in Paris. Ninth competition: a government printing, lithographing and engraving establishment, to which is attached a museum of typography. Tenth competition: the monumental treatment of the lower end of Manhattan Island. Eleventh competition: a city hall for a city having the commission form of government. Twelfth competition: the capitol building for the League of Nations. Thirteenth competition: a great war memorial to be erected in New York. Fourteenth competition: an exhibition center with facilities for conventions, assemblies and exhibitions of all kinds. Fifteenth competition: a city hall group composed of two buildings, one for administration and one for the formal reception of distinguished visitors. Sixteenth competition: a structure to be erected near the White House, in Washington, to be used as an office and reception building by the president. Seventeenth competition: a transportation institute combining exhibition halls, etc, with facilities for research and inventions along transportation lines. Eighteenth competition: a group of legislative buildings for the summer capital of the United States. Nineteenth competition: a natatorium in a park in an inland city. Twentieth competition: a radio broadcasting station. Each of these competitions is shown by several plate reproductions of the original drawings, printed on heavy paper, together with a printed copy of the original program for each of the competitions. These pages are enclosed in an attractive loose leaf binder, so that any of the designs may be removed and used independently of the rest, which makes it very practical.

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By Rexford Newcomb, University of Illinois

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The Philadelphia Museum of Art
From a Litho-Pencil Rendering by Herbert Pullinger, Frontispiece

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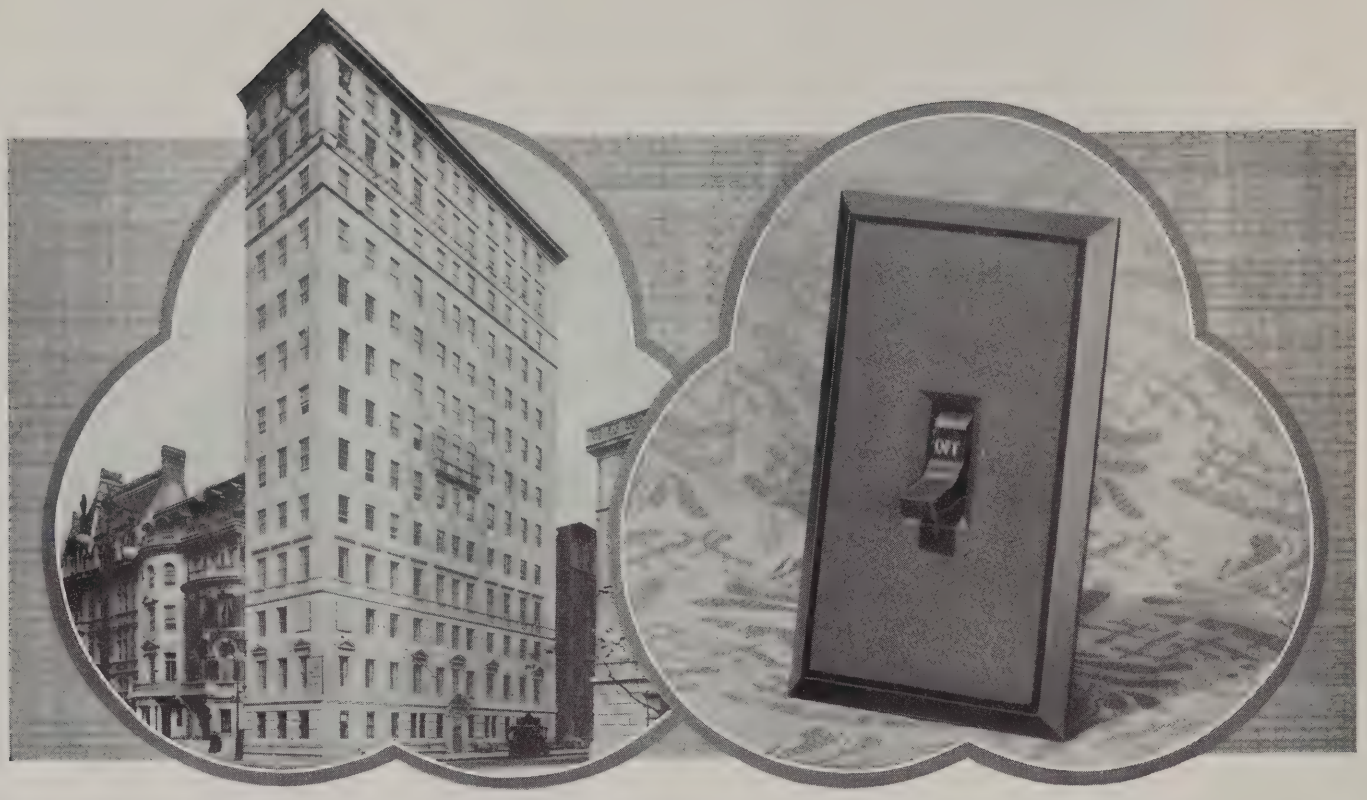

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THE EDITOR'S FORUM

THE DEATH OF MR. MEAD

ANNOUNCEMENT is made of the death in Paris, on June 20, of William Rutherford Mead, the last surviving original member of the firm of McKim, Mead and White. The son of Larkin Goldsmith and Mary Jane Noyes Mead, William Rutherford Mead, was born in Brattleboro, Vt., on August 20, 1846. He was graduated from the Brattleboro High School and entered Norwich University in 1861 remaining there until 1863. In 1909 that University gave him the degree of Master of Sciences. In the fall of 1863 he entered Amherst College being graduated with the degree of A. B. in 1867. He received the honorary degree of LL.D. from Amherst in 1902. After leaving college, Mr. Mead began the study of architecture in the New York office of the late Russell Sturgis in 1868. In 1871 he went to Florence and continued his studies in architecture there for a year, afterward spending six months in travel in other European countries. In 1872 Mr. Mead began the practice of his profession here with the late Charles F. McKim. Stanford White became associated with them in 1878.

Since the deaths of Mr. McKim and Mr. White, Mr. Mead had continued to practice under the old firm name in association with partners who grew up with the firm and were admitted to partnership while Mr. McKim and Mr. White were still living. The firm has designed many of the most notable structures in the country, among them being the Agricultural and New York State Buildings at the World's Columbian Exposition at Chicago in 1893; the Boston Public Library; Rhode Island State Capitol; the old Madison Square Garden; and the Columbia Library and other buildings of that university; also the library and other structures at the College of the City of New York; the University of Virginia, the University, Century, Metropolitan, Harvard, and Racquet and Tennis Club of New York; the War College at Washington and the reconstruction of the White House; the General Post Office in New York; the Municipal Building; the Pennsylvania Station; Bellevue Hospital; Brooklyn Institute of Arts and Sciences; additions to the Metropolitan Museum of Art; Madison Square Presbyterian Church; Bank of Montreal; Knickerbocker Trust Company; and the National City Bank.

NEW YORKER ON FINE ARTS BOARD

Ezra Winter, of New York, was recently appointed by President Coolidge to be a member of the Commission of Fine Arts. This Commission determines upon art of federal buildings in Washington.

RESTORATIONS AT SULGRAVE

WHEN American visitors to Sulgrave Manor this year inspect the ancestral home of George Washington, they will find that an entire wing, known to have been pulled down in the eighteenth century, has been reconstructed. Thus Sulgrave Manor has progressed one step further in the restoration of its former condition, and the ancient house, which carries the history of the Washington family back to the days of King Henry VIII, is beginning to look as it did when the Washingtons moved to Virginia, according to *The New York Times.*

"With the partial restoration at the hands of the Sulgrave Institution several years ago, the fine old sixteenth century mansion seemed architecturally incomplete. Last year it was decided that the missing wing should be rebuilt in scrupulous harmony with the rest of the building. The architect chosen was Sir Reginald Blomfield, whose reconstruction of Regent Street in London has helped to stamp him as a leader of his profession. In preparing the plans for Sulgrave Manor, Sir Reginald tried to visualize the building as the Washington family left it. The result is that externally the new wing is so in keeping with the opposite wing of the house that it has the appearance of sturdy old age.

"The stone for the wing was cut in the neighborhood of Sulgrave, weather-worn rock being selected wherever possible. The roof is of stone slates, which have the picturesque, dulled color of age. Creeping plants and vines grow up over the new wing, concealing any difference between the parts.

"But it is the surrounding country-side even more than the house itself which breathes the placid, gentle beauty of old England. Behind the south garden stretches an orchard with apple trees all in the glorious bloom of an English Spring. If one looks across the yew hedge-row and smooth green lawn with its border of flowers which will soon be blooming, one can see the gracious old mansion standing in the plain dignity in which it stood centuries ago. A modern blue-slated barn which sprawled across the picture until a few weeks ago has been torn down, so there is now nothing to spoil the illusion or to mar the simple, old world setting.

"The expense of the restoration has been collected from individual members of the Colonial Dames of America, supplemented by admission fees to the manor house. Last year more than 10,000 persons, mostly Americans, visited the historic house. It is hoped that from the same sources money will come to complete the restoration of the seventeenth century rooms, until recently used by the caretaker."

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THE PHILADELPHIA MUSEUM OF ART

CHARLES L. BORIE, JR., CLARENCE C. ZANTZINGER
AND HORACE TRUMBAUER, ARCHITECTS

From a Litho-Pencil Rendering by Herbert Pullinger

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER ONE

JULY 1928

THE PHILADELPHIA MUSEUM OF ART

CHARLES L. BORIE, JR., CLARENCE C. ZANTZINGER and
HORACE TRUMBAUER, ASSOCIATED ARCHITECTS
BY
HAROLD D. EBERLEIN

THE Philadelphia Museum of Art, in Fairmount Park, must be considered from three points of view if we wish to understand it in its true significance. These three points of view, though distinct in themselves, are all closely related each to the others. In the first place, the building invites examination as a work of architecture. Next, it claims our regard as an important and indeed a pivotal factor in a remarkable program of regenerative city planning. Finally, representing as it does the last word in museum arrangement, it requires more than merely passing notice on the score of convenience.

As an architectural achievement, it should be plainly said at the outset that the three associated architects,—Charles L. Borie, Jr., Clarence C. Zantzinger, and Horace Trumbauer—make no claim whatever to originality in either the conception or the realization of what has been performed. And, if we seek for evidence of that quality, we shall not find it. After all, it is quite possible to question whether any great degree of originality is especially to be desired in a building of this sort. The absolute fundamentality of Greek classicism for a museum has something to be said in its favor. In some way we have come to associate with it a certain universal propriety, just as French is recognized as the common language of diplomacy. The Greek mode is safe, dignified and restful, whatever else it may or may not be. In employing it one is saved the risk of experimental uncertainty. It is altogether a known quantity. Thanks to its general acceptance as the embodiment of quiet simplicity and perennial decorum, a Greek building affords a setting for the diversity of exhibits brought together within its walls,—a setting if not warmly sympathetic, at least charitable and unobtrusive. Again, for a building whose structure and purpose constitute a source of æsthetic and financial concern to an enormous community with inevitably divergent tastes, it may be questioned whether a type of design less generally accepted as a standard of fitness would have been altogether justifiable. Furthermore, in a case where three associated architects were involved, a classic Greek expression was the only form upon which they could unanimously agree as the proper style.

The ideal that actuated the architects in this instance finds its explanation in a passage from J. D. Beazley's translation of Ernst Pfuhl's "Masterpieces of Greek Drawing and Painting". From the west coast of Asia Minor, the land of Homer, to the Golden Gate of San Francisco, and away to Sydney and Wellington; from the immigration of the Greeks into their historical homes to the present day, four thousand years of history and a single culture unite the peoples of the West. The roots of their thought and their motion are in Hellas, where European humanity manifested itself for the first time, and with incomparable clarity, purity, and beauty, in home and state, in art and poetry, in thought and science. Wherever Europeans have settled and great communities have expressed themselves in monumental buildings, there we find Greek columns and pediments, Greek orders and mouldings. These are something more than a historical symbol; for even where the architect has been but partially conscious of the forms which he has employed, something of the magic of Hellas lingers in these late descendants of Greek architecture. In architecture and the figurative arts, as in philosophy and poetry, the Greeks turned all they touched into forms of crystalline clearness, whose beauty was the natural expression of their intrinsic necessity. Their works of architecture and of political and philosophical thought, no less than their poetical and artistic creations, are permeated with organic life. . . . Greek humanity and Greek mastery of form laid the foundation of a luster which no subsequent period, however great its achievements, has equaled; for the luster is the light of pure youth."

Profound respect for our legacy of Greek culture, and recognition of Greek forms as a part of our common heritage, need no apology for their expression in tangible form. Though the building of the Philadelphia Museum of Art be denied the appeal of originality, it is an outstanding example of archæological achievement. The propriety of an archæological presentation once determined, the architects spared no effort to make their work as archæologically perfect as possible, regardless of the labor and research entailed. In the matter of refinements and

Photos. Courtesy of the Pennsylvania Museum

Entrance Door into Main Stair Hall

subtleties practiced by the Greek builders for the purpose of correcting optical illusions and mitigating the starkness of absolutely straight lines and right angles, the greatest care was exercised to conform to the best traditions of antiquity. This adherence to Greek precedent is one of the most unusual features of the building. It was a labor of love with Professor Goodyear to check the drawings for the Museum, with the aim of making it agree in its refinements with the refinements of the Parthenon as recorded by him. Subtleties and variations from absolutely linear rectitude, which it was often impossible to indicate even on large scale drawings, were taken care of in the course of actual superintendence. The walls of the pedimented ends for the central pavilion and wings are slightly convex, and the column centers of their porticoes, along with the entablatures, follow the same nearly imperceptible curve; the intermediate walls of the wings are concaved and given a slight batter; the roof peaks are convex, as are likewise the steps of both approach and main entrance; the long horizontal lines of the stylobate and cornice are slightly convexed upward, while there is a comparable convexity in the horizontal across the base of the pediment; and endless similar corrections were made so that the finished structure might realize that ideal of "elasticity and vigor of aspect,—an elusive and surprising beauty impossible to describe and not to be explained by

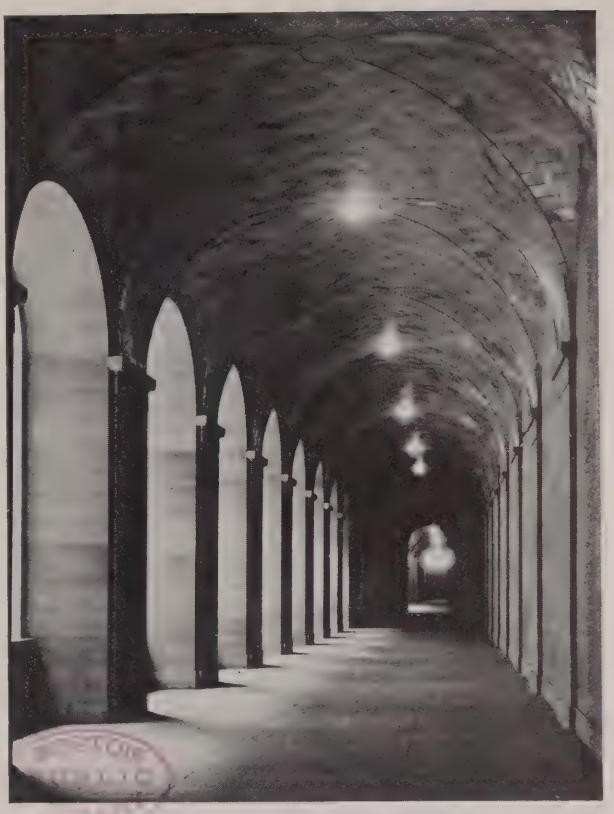
From a Rendering by Hugh Ferriss

The Philadelphia Museum of Art

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

the mere composition and general proportions, yet manifest to every cultivated eye." It is only fair to add that the solicitude shown during the course of erection has been justified in the outcome.

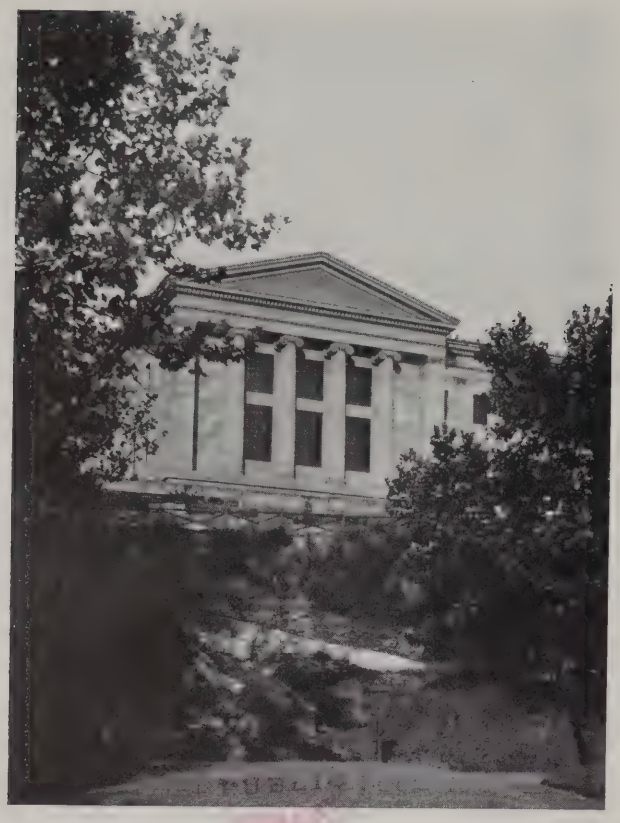
The one feature of the Museum most likely to excite widespread interest and comment is the use of color on the outside. The Minnesota Mankato and Kasota stone, of which the Museum is built, has itself a warm, glowing, tawny hue of a very distinct character, approximating a ground color often used by the Greeks to cover the whole exterior of a marble or stuccoed building. The glazed roof tiles give a varied mass of blue ranging from turquoise to indigo. Many would let it go at that. The mere mention of exterior architectural polychromy is usually enough to send off the disapproving into a volley of prejudiced deprecation. Tradition, almost unbroken since the Renaissance, so they say, has been against it. If the truth be known, there has really been more post-Renaissance external polychromy than they care to recall. The alleged weight of tradition creates a handicap to start with. Claiming the authority of time-honored usage, the anti-colorists are wont to rail at the use of polychrome adornment as a spectacular effort to galvanize dry classicism into the semblance of a living interest fundamentally alien to it. It is a ruse to divert the public eye from poverty-stricken platitudes by dangling before it a bright-hued toy. Dubious neutrals, taking refuge



Vaulted Corridor in the Basement

South Front of The Philadelphia Museum of Art from the Parkway

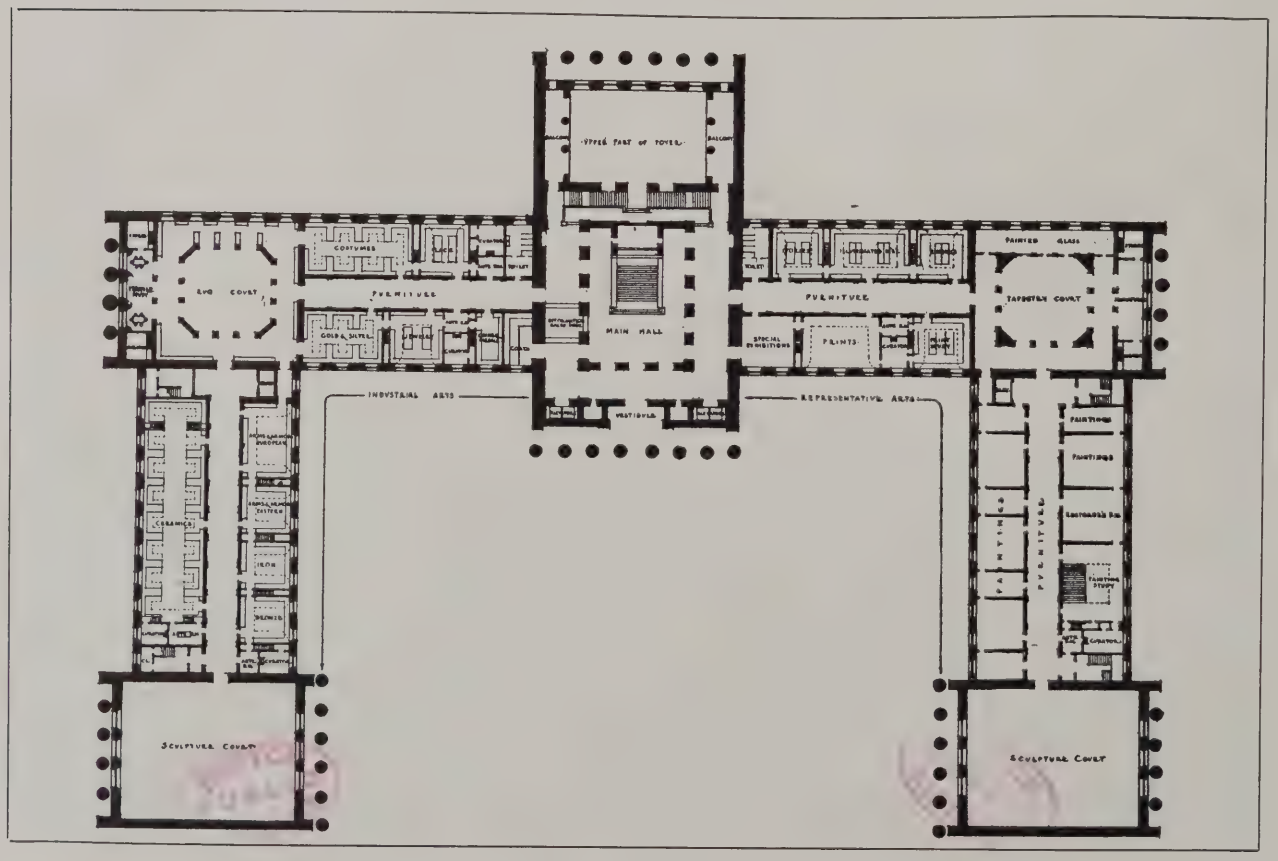
Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects



Pedimented Motif of Front of the Southwest Pavilion from the Parkway

in a non-committal stand, query the manner of polychrome performance and intimate that most of the modern attempts are ill-conceived. As a matter of fact, use of external polychromy of a very vivid sort was a recognized and effective factor in the aspect of Greek buildings. The relations of color to composition and the proportions of both structural members and incident details constituted a carefully reasoned code. When the architects of the Museum committed themselves to a program of archæology, they very properly included accuracy of color treatment as well as accuracy of form.

Too much credit cannot be given for the thorough research brought to bear in the accomplishment of this task and for the scrupulous fidelity to classic precedent shown throughout. The constant collaboration of Leon V. Solon, who has made the field of exterior polychromy peculiarly his own, has been invaluable; likewise must acknowledgment be made for the whole-hearted coöperation of the sculptors, John Gregory and C. P. Jennewein, who are responsible for the groups in the polychromed portions of the exterior,—the groups in the pediments, the cresting of the roof, the capitals of the columns and pilasters, and sundry other details,—all executed in lustrous glazed terra cotta. Incidentally, it should be mentioned that the physical requirements of the occasion have called forth an entirely new development in manufacturing technique. Brilliant colors were employed, "adaptable to conditions of visibility



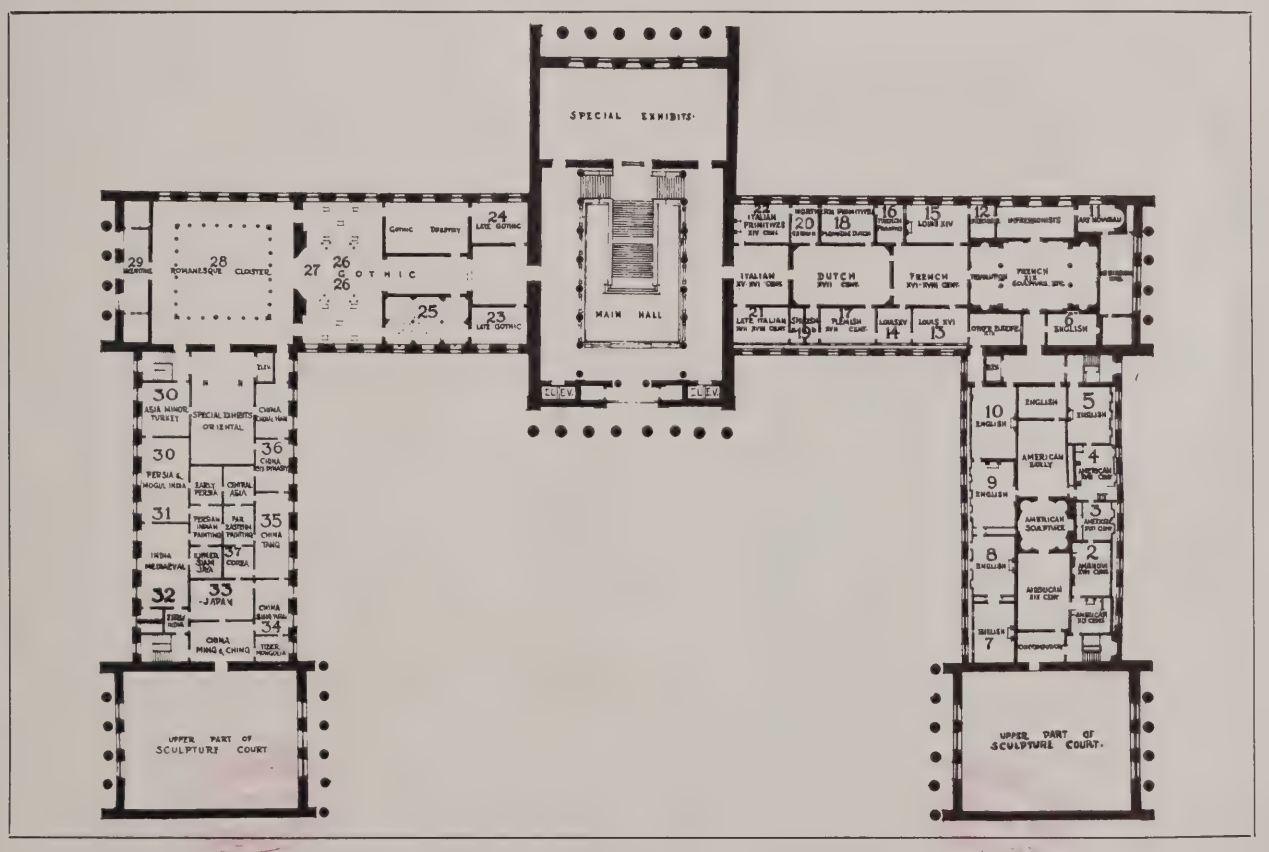
Plan of the First or Study Collection Floor, The Philadelphia Museum of Art

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

at long range,"—scarlet, vermilion, gold, black, buff, blue and green. Many problems in the distribution of color had to be solved. As Mr. Solon writes, "when each group had finally reached a state of development which appeared to leave detail in doubt, it was cast in plaster and shellacked ready for coloring." When the groups were colored they "became as sensitive as a musical instrument, and color was in actuality a dynamic force which could link together or completely separate features in composition." The effects of color were no less pronounced when applied to mouldings, dentils, triglyphs, foliage and other details. The chromatic balance with regard to articulation and accent had to be delicately adjusted. Hearty commendation is due the architects and those who labored with them in realizing an exterior polychrome scheme for a building of classic character more comprehensive than anything that has been attempted since the golden age in Greece. This venture in polychromy marks a signal achievement in the realm of American architecture and is bound to exert a far-reaching influence. It will unquestionably disturb the equanimity of that type of classicists who have cultivated a sense of form only and an obsession for icy, drab austerity.

It is too soon, perhaps, for the general public to arrive at a stable estimate of the value of the Museum. Architectural ideals are in a state of flux and conflict; æsthetic perception is likely to be abnormally sensitive and irritable. Critics, with whose

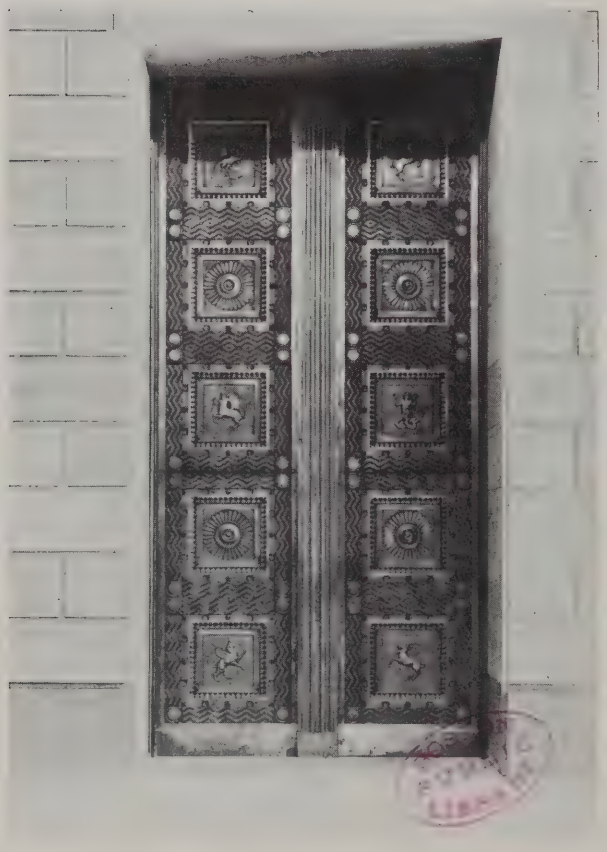
The Museum and Buildings of the Old Water Works from Across the River



Plan of the Second or Principal Exhibition Floor, The Philadelphia Museum of Art

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

One of the Georgian Rooms in The Philadelphia Museum of Art

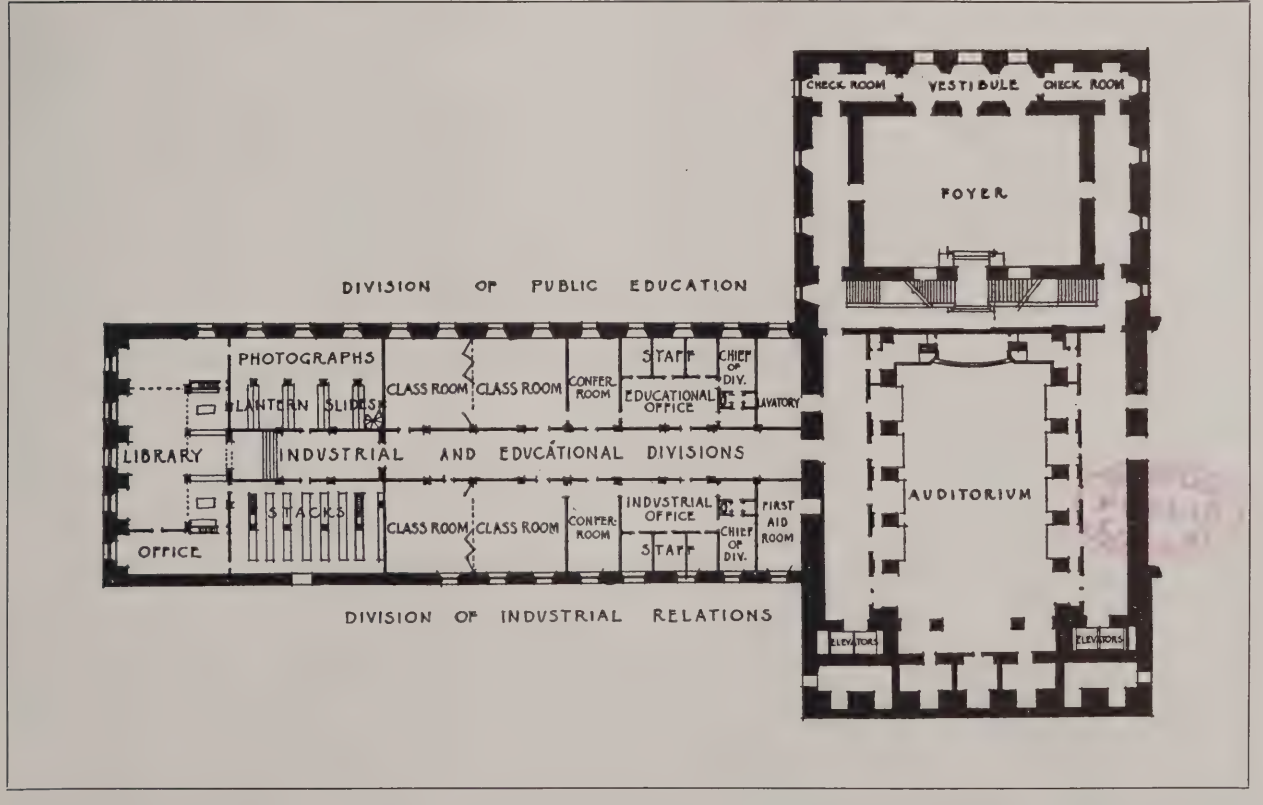


Detail of Bronze Elevator Doors

particular preference some comparatively minor matter does not exactly coincide, are often unduly harsh and disposed to magnify disapproval of a single feature into blanket condemnation. Those opposed to exterior polychromy, by prejudice or conviction, are sometimes so intemperate in their expression of dislike that one is disposed to quote to them in rejoinder Hoffenstein's lines: "There's something wrong with all of us; let's ask the Hippopotamus." At last, when Philadelphia's full scheme of civic reconstruction shall have been realized, the scheme of which the Museum is the pivotal feature, the structure crowning with its ordered serenity the eminence at the end of the Parkway will come into its own. When that day comes, those who have borne the burden of decision in all matters affecting the Museum and the entire program connected with it will have the justification to which they are entitled.

Aside from immediately architectural considerations, the Museum holds the key position in a program of city rearrangement without parallel elsewhere. Years ago, one chilly April morning, Mayor Reyburn took a party of politicians and officials to the top of the old Fairmount reservoir hill and bade them look from there to the City Hall tower. They looked, and saw a mile or more of closely built city blocks traversed by a network of streets running at right angles. The Mayor then broached the project of a museum and art gallery to crown the reservoir hill, and a broad parkway lined with civic buildings

GEORGIAN ROOM FROM TREATY HOUSE, UPMINSTER, NEAR LONDON



BASEMENT PLAN, SHOWING FACILITIES FOR GROUP DISCUSSIONS, SPECIALIZED SERVICES AND PUBLIC LECTURES
THE PHILADELPHIA MUSEUM OF ART
CHARLES L. BORIE, JR., CLARENCE C. ZANTZINGER AND HORACE TRUMBAUER, ASSOCIATED, ARCHITECTS

running straight as a die from the foot of the hill to the City Hall. This was the initial public step towards realizing the city's hitherto neglected opportunities. The Mayor's proposal dismayed his companions, who could see nothing ahead but utter impossibility: it "wrung shouts of anger and derision from people who presented themselves as spokesmen for the 'unfortunate taxpayers.'" Nevertheless, year by year the dream envisioned by Mayor Reyburn has gradually been coming true. The completion of the Museum, the Parkway, and an appreciable showing of its flanking buildings will inevitably hasten the ultimate rounding out of the entire scheme with its extended boulevards on both banks of the Schuylkill. The torrents of complaint, hostile criticism and narrow-minded spite poured for years upon those who have stood at the forefront of this tremendous project have not changed the steadfast purpose of the program adopted. The President of the Park Commission, roundly abused and charged with "czarism," has been happily oblivious to the maledictions constantly showered upon him and has vindicated the "autocracy," of which he has been accused, by its intelligence and the accomplishment of tasks, confronted with which a more theoretically appropriate democratic course would have proved utterly futile. Thanks to the combination of circumstances, the Museum, now a *fait accompli,* appears as a visible and convincing warrant of what has been done, stands forth as a fitting and dignified terminus of the Parkway vista, and renders imperative the southern extension of the east and west boulevards along the Schuylkill. Its bearing as a central feature in a great civic composition must not be overlooked in the estimate of its significance.

In the arrangement of the Museum's plan, the primary objects were the greatest possible measure of educational utility, and the opportunity for future growth in accordance with a unified, coherent scheme. Since "a living museum has two distinct functions to perform,—to maintain an exhibition gallery and to conduct a school with research laboratories,"—the building "is divided into two main floors,—an exhibition floor and a study collection floor." Below the main exhibition floor is the study collection floor where, by a cross classification with the exhibits on the principal floor above and by unusual facilities for study, the educational usefulness of the Museum is increased; below the study floor, again, there is a floor for the educational departments and for the research laboratories. The arrangement of the main exhibition floor provides for central galleries flanked on each side by a series of period rooms, true in every detail to the times and places from which they have come. In these rooms are exhibited the finest of the contemporary paintings, furniture, and all the appropriate decorative accessories. Among such rooms already installed are a room from the Treaty House, Upminster, near London; eighteenth century rooms from Sutton-Scarsdale and Wrightington Hall, in Derbyshire; the great parlor of the Powel House, Philadelphia; a room from the early nineteenth century Derby House, in Salem; and two early Pennsylvania-German rooms from the Millbach house.

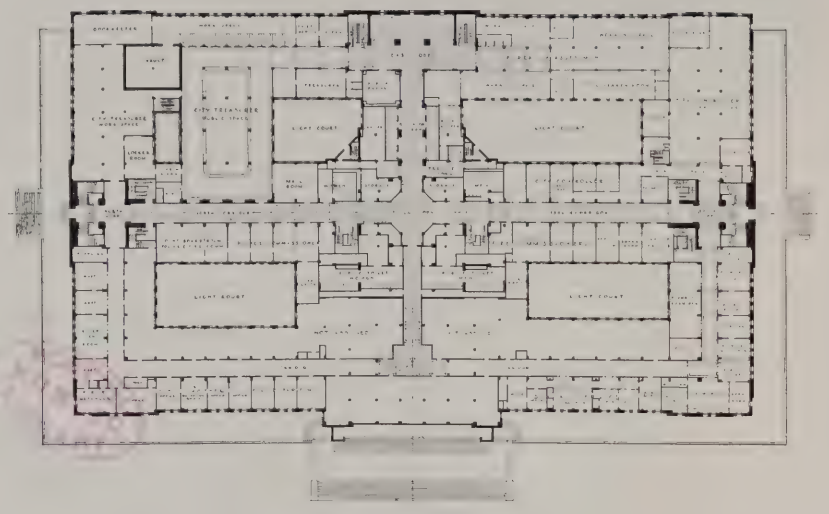
One of the Exhibition Galleries, The Philadelphia Museum of Art

Photos. Miles Berne

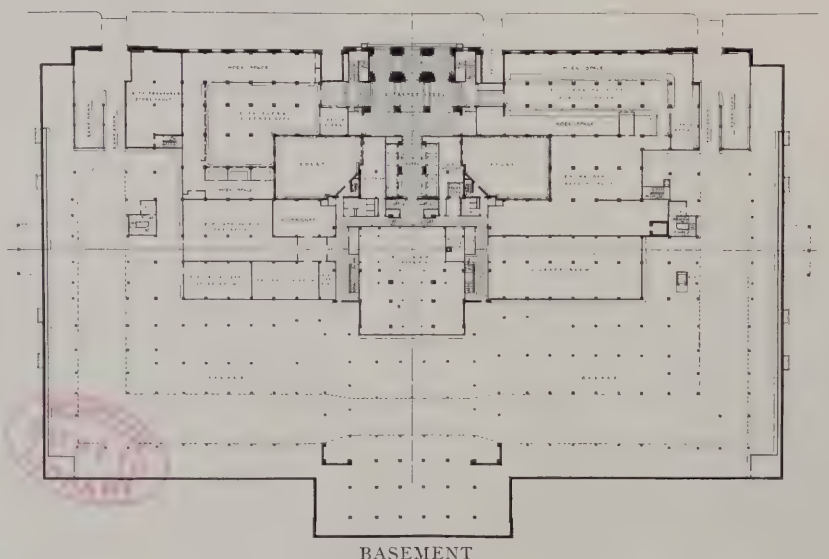
Plans on Back

LOS ANGELES CITY HALL

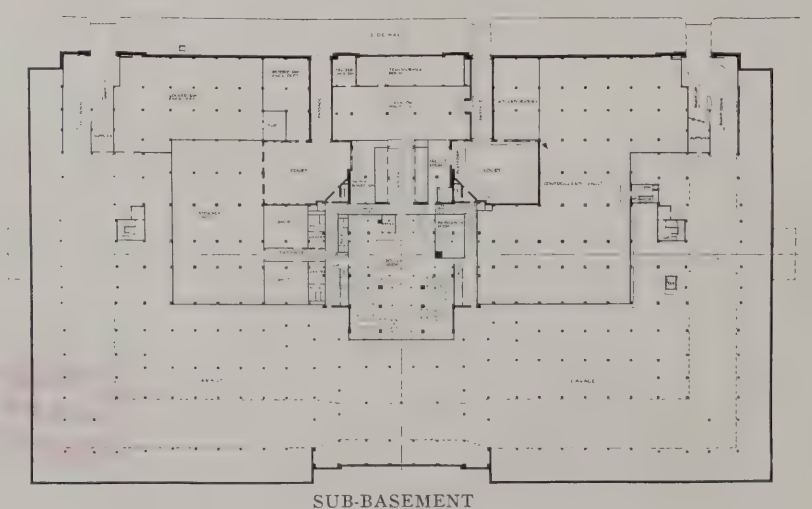
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



GROUND FLOOR



BASEMENT



SUB-BASEMENT

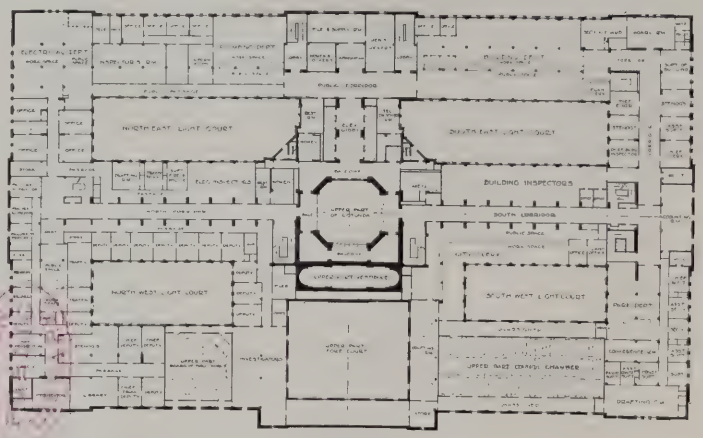
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

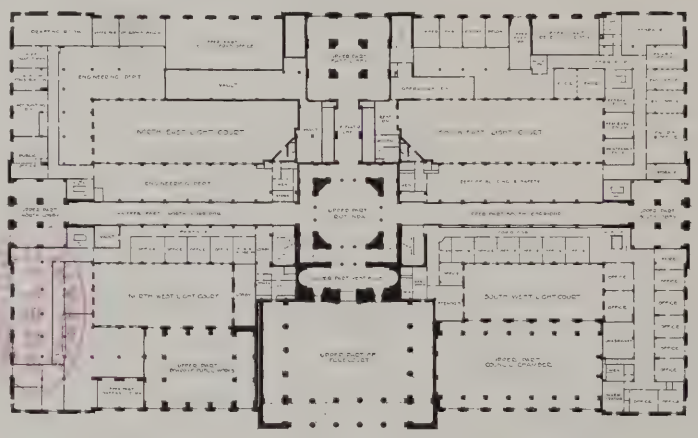
Plans on Back

MAIN ENTRANCE TO FORECOURT, LOS ANGELES CITY HALL

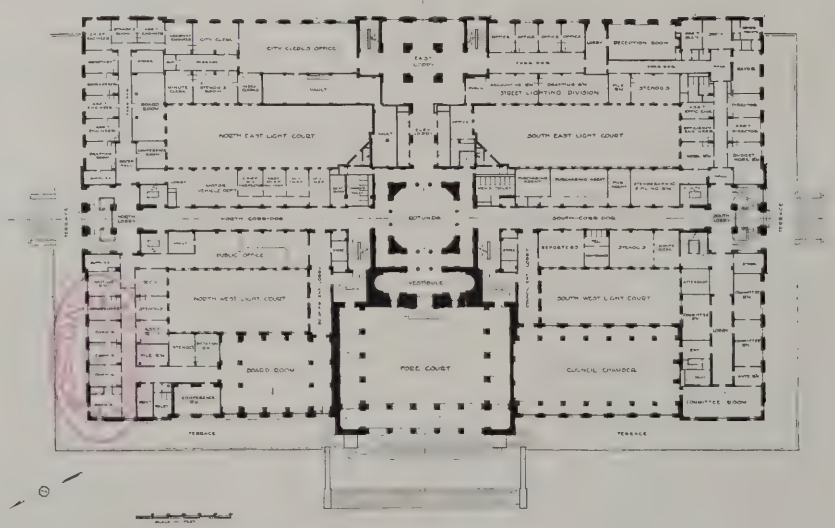
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



SECOND FLOOR



MEZZANINE FLOOR



FIRST FLOOR

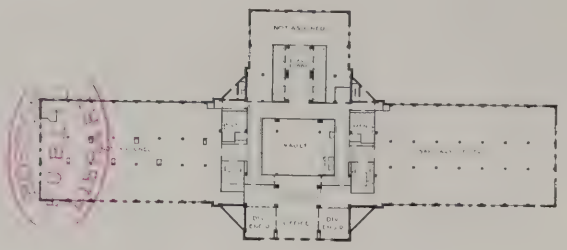
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

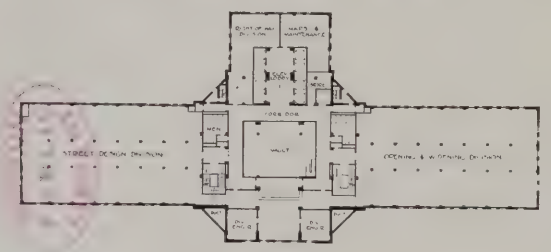
Plans on Back

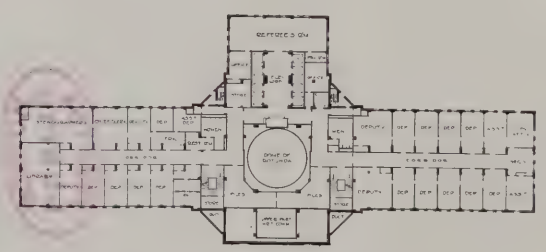
ARCADE IN FORECOURT, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

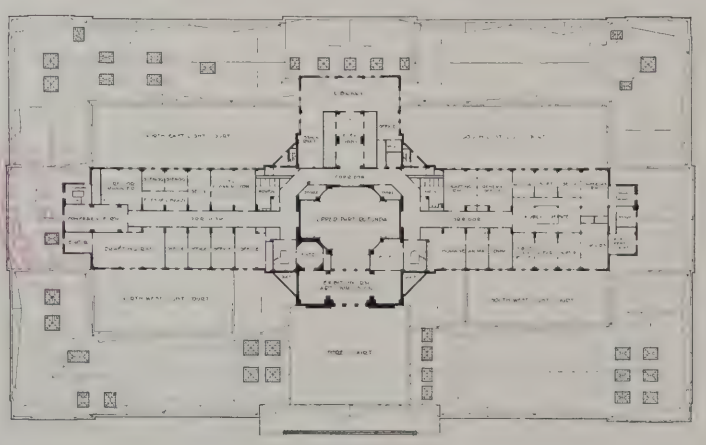


SIXTH AND SEVENTH FLOORS





FOURTH AND FIFTH FLOORS



THIRD FLOOR

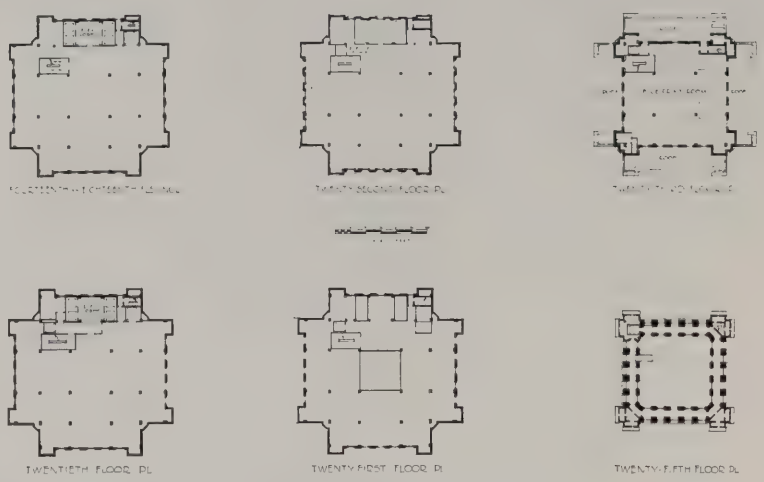
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

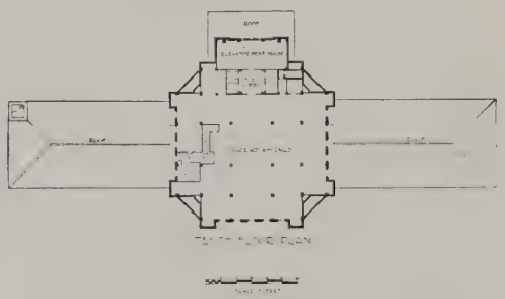
Plans on Back

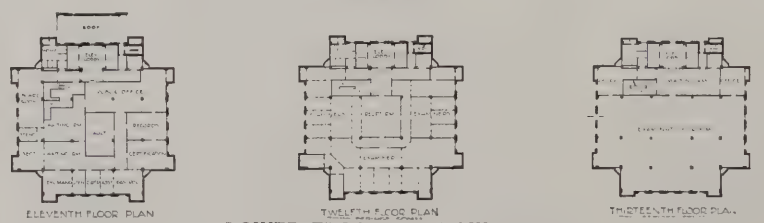
ENTRANCE FROM ELEVATOR LOBBY INTO ROTUNDA, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

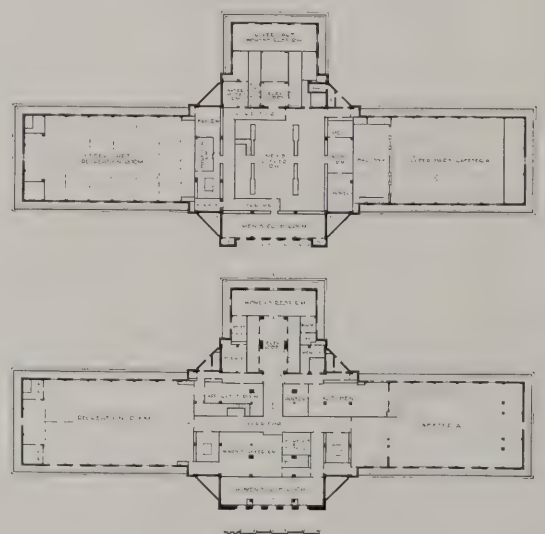


UPPER FLOORS IN TOWER





LOWER FLOORS IN TOWER



EIGHTH AND NINTH FLOORS

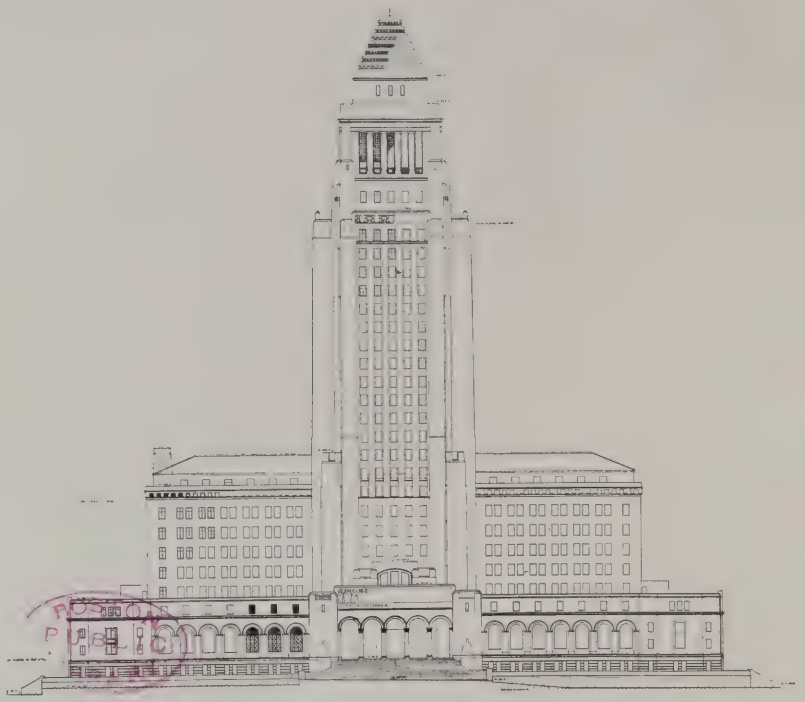
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

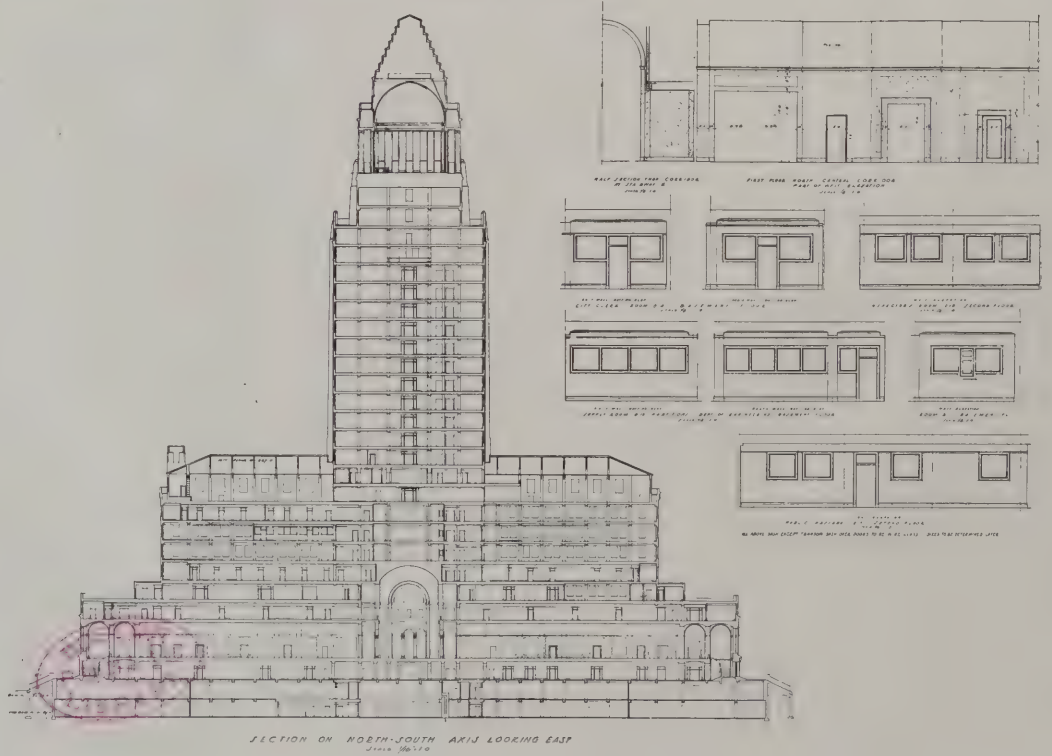
Elevations on Back

ELEVATOR LOBBY, FIRST FLOOR, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



WEST ELEVATION



LONGITUDINAL SECTION

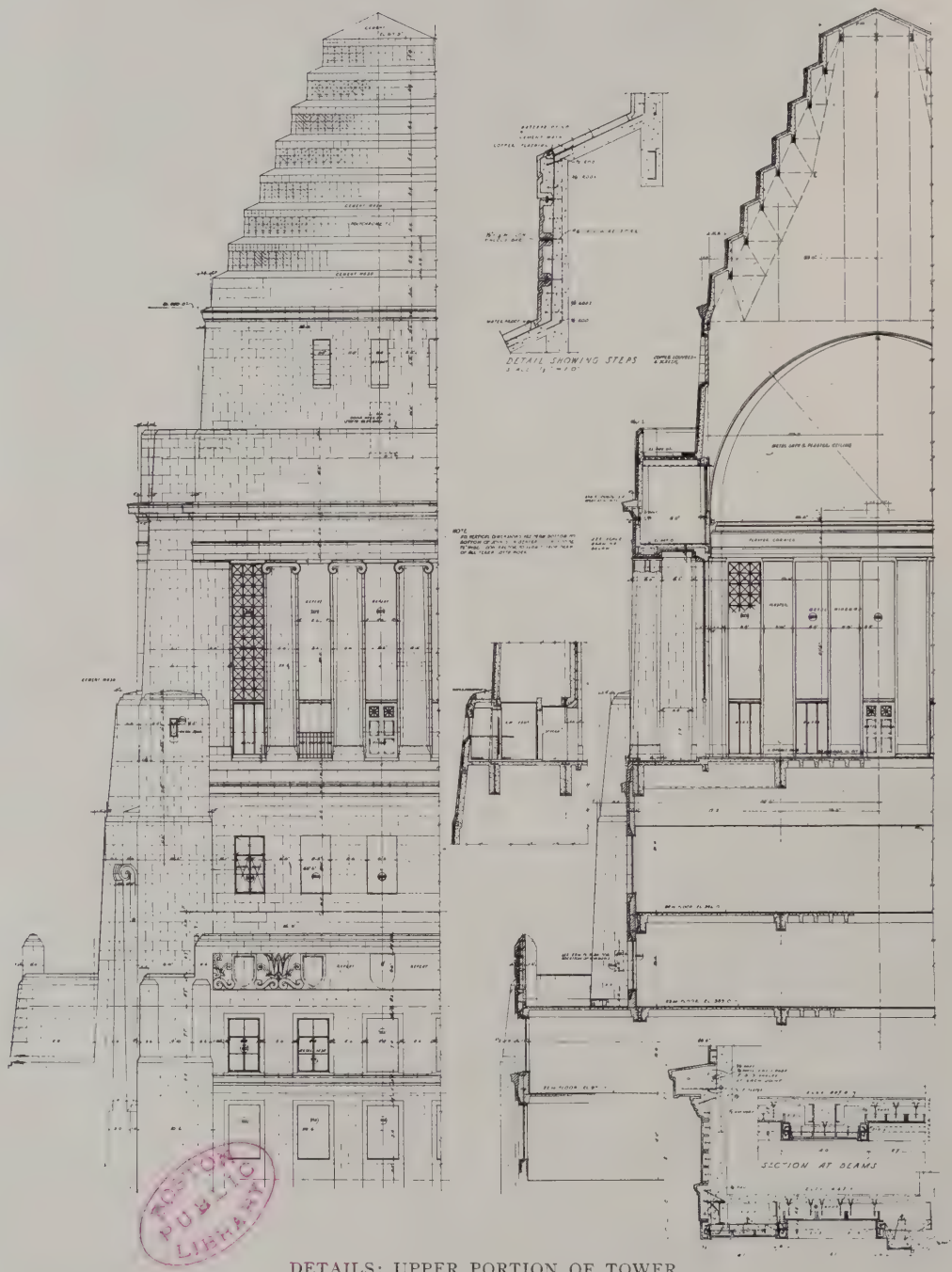
ELEVATION AND SECTION. LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

Details on Back

STAIRWAY, EAST LOBBY, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



BOSTON PUBLIC LIBRARY

DETAILS: UPPER PORTION OF TOWER

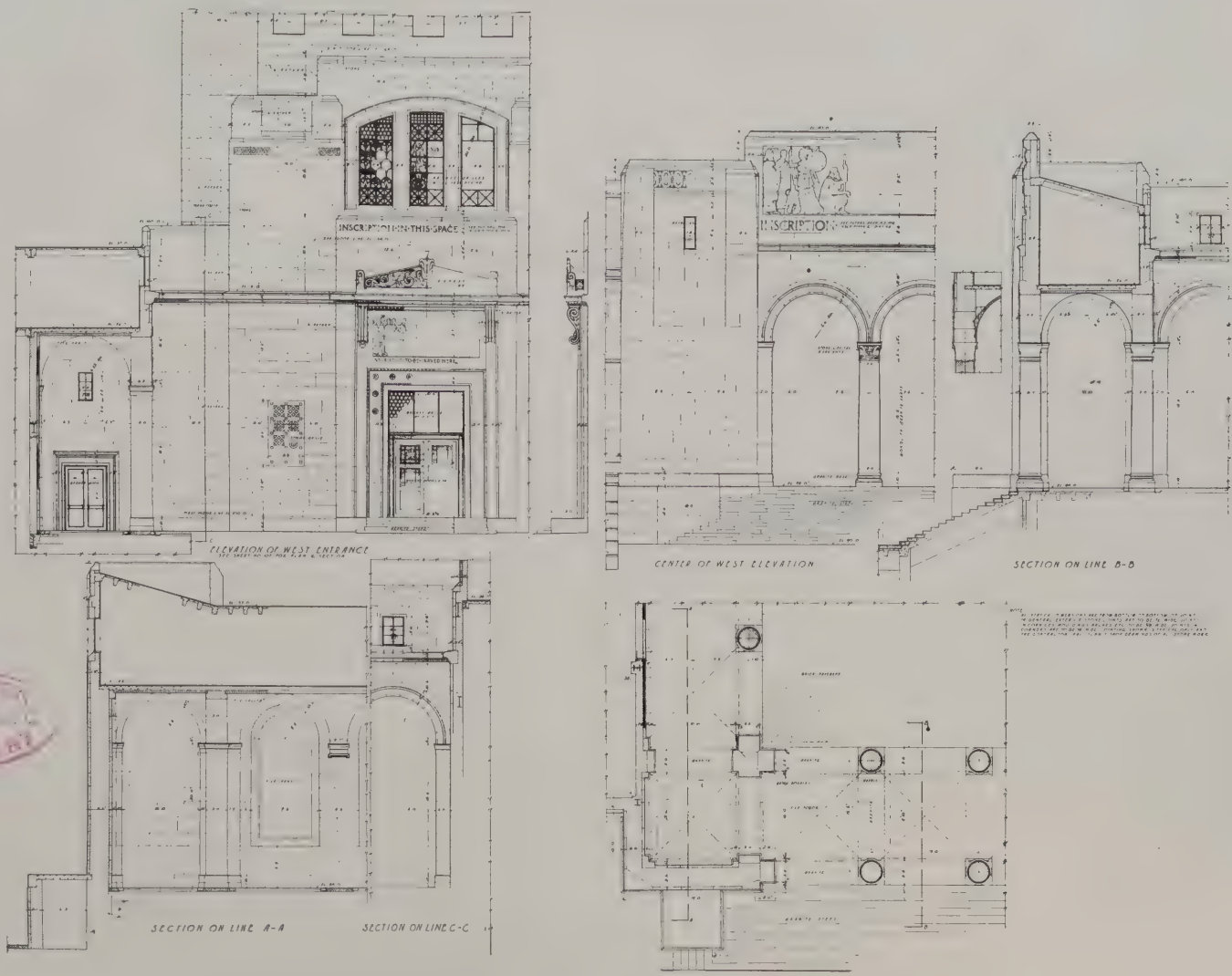
LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

Details on Back

COUNCIL CHAMBER. LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED ARCHITECTS



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DETAILS: WEST ENTRANCE AND FORECOURT

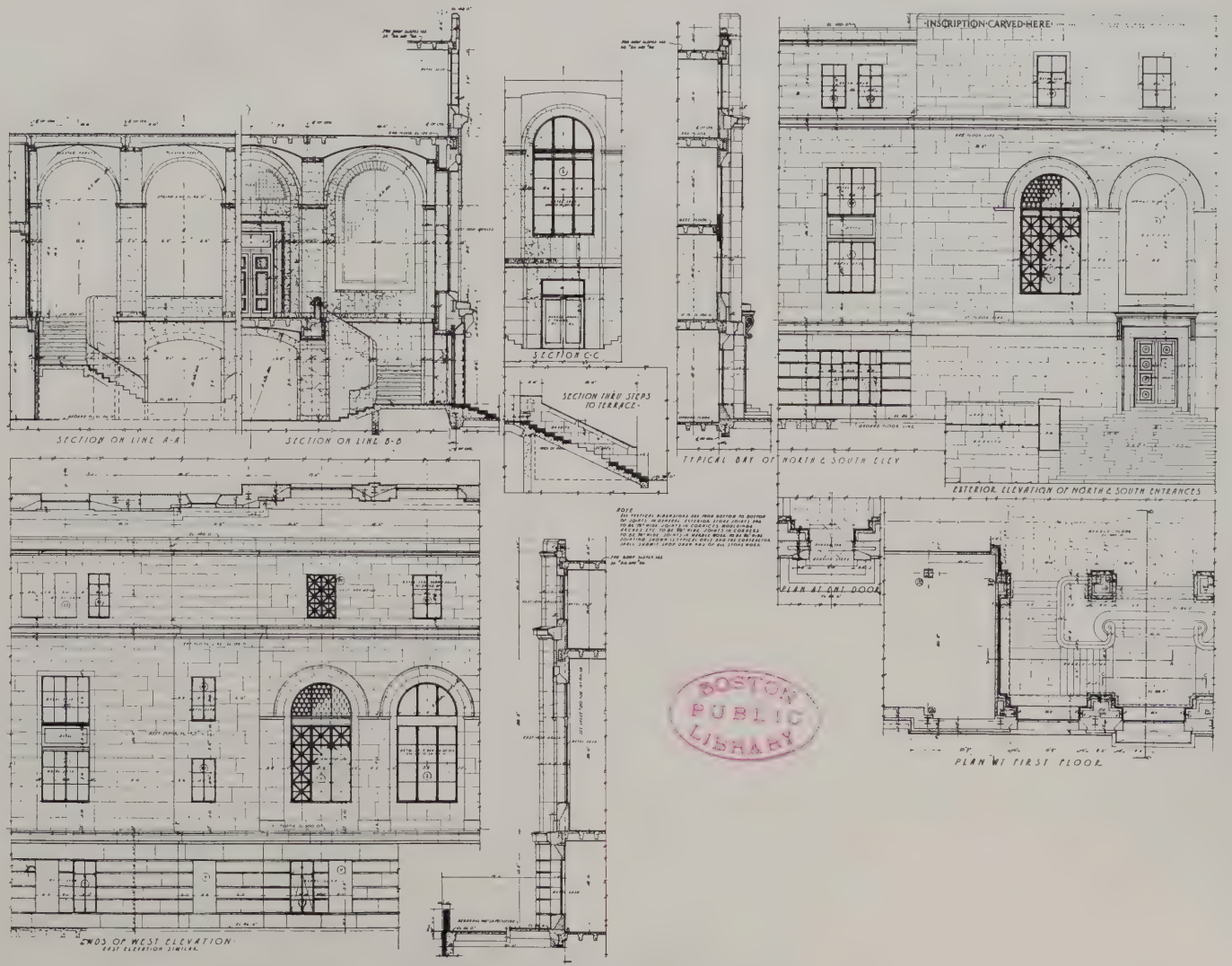
LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

Details on Back

SESSION ROOM, BOARD OF PUBLIC WORKS, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



DETAILS: NORTH AND SOUTH ENTRANCES

LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

THE LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

BY

JOHN C. AUSTIN

LOCATED in a section of the city in which, up to a generation ago, its commercial and social activities were largely centered, the new City Hall is a conspicuous landmark in the area about to be transformed into a civic center, comprising practically all important city, county, state and federal buildings. It is more noticeable owing to the fact that the height limit of all privately constructed buildings is 150 feet, and special legislation had to be enacted to enable the city to exceed this height. The legislation referred to developed a point interesting to all architects,—that a municipality is not governed by its own ordinances; therefore, public buildings can be built to any height, while privately owned buildings cannot exceed the height established.

In their preliminary consideration of the problem, the architects determined not to confine themselves to any particular style of architecture in the general design of the building, and the completed structure shows that this determination was carried into effect. Grecian detail was adopted for the main entrance, while Romanesque was used in the arcades of the forecourt, rotunda, council chamber and the Board of Public Works room. The tower and the flanking wings may be regarded as "modern American", influenced by the present-day setback style so widely adopted in other parts of the country.

The building consists of three apparently separate and distinct units, the first of which may properly be termed the sub-structure, extending from the street grade to and including the second story; the second is the central tower, and the third the wings flanking it on the north and south. Native California light gray granite has been used for the facing of all exterior walls of the sub-structure from the sidewalk grades to the tops of the parapet walls surrounding its flat roof. It extends through the forecourt and on that portion of the tower fronting the court to the top of the large central window in the third story. All columns in the court are monolithic with richly carved capitals. All other exterior walls, to the very apex of the pyramid roof of the tower, are faced with dull or matt glazed terra cotta, harmonizing with the granite so perfectly that the difference between them is scarcely discernible. The walls of the four interior light courts are faced with a delicate buff brick laid in white mortar. The roof of the sub-structure is of composition, while the flanking wings of the tower are roofed with clay tile of varicolor,—fire-flashed reds, browns, and old golds.

The front arcade is flanked by plain, massive pylons, which will serve as a substantial background for the statuary proposed to be placed on the large granite buttresses at some time in the future. The large panel over the arcade is intended to be sculptured by an internationally known sculptor to represent local historical events or celebrated personages, whenever the necessary funds become available. Spe-

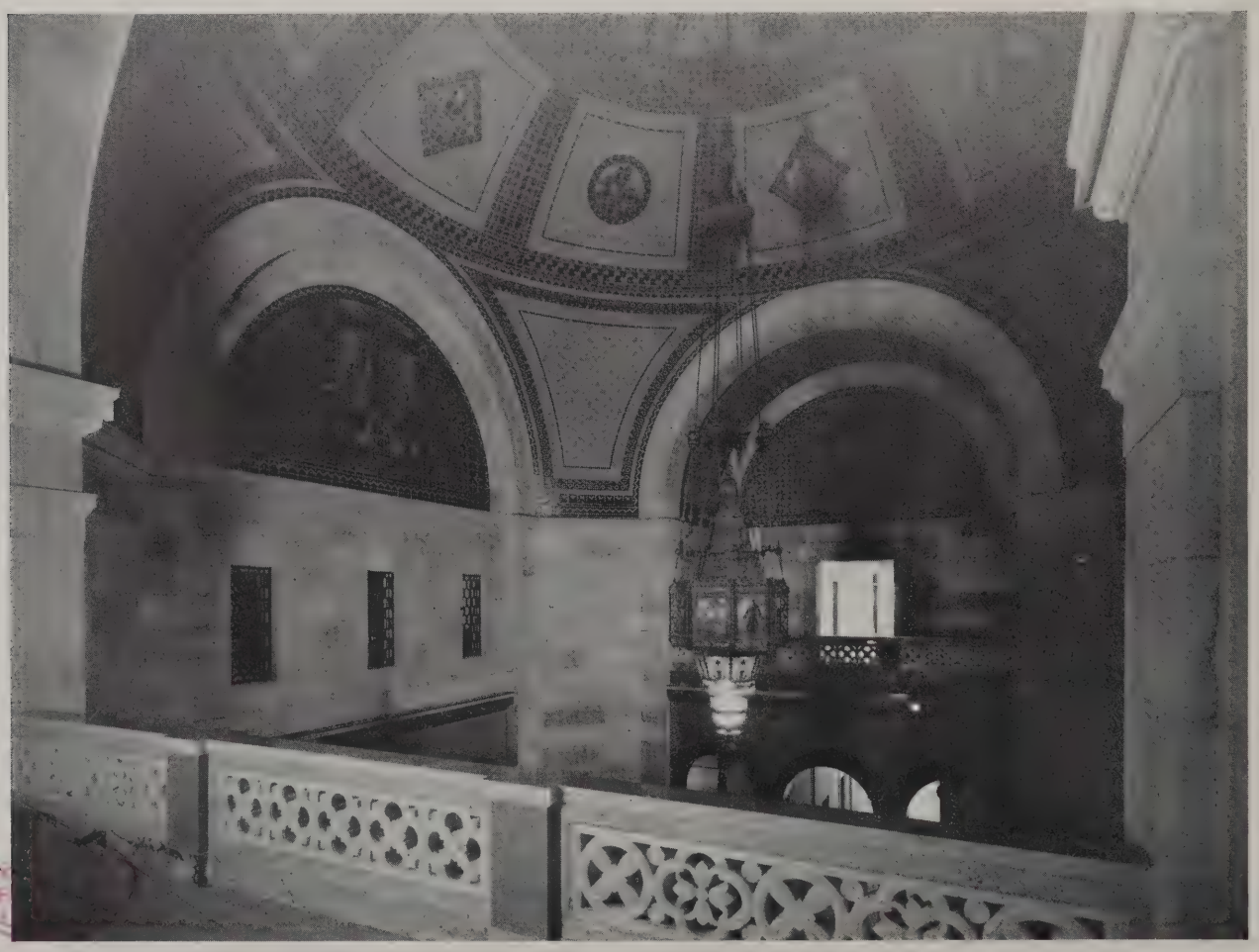
Photos. Niles Berne

Observation Room, Twenty-fifth Floor

Arcade Around the Rotunda

cial attention is directed to the main entrance, which is monumental in character and Grecian in detail, with broad moulded and carved architrave and moulded cornice supported on carved consoles. The pediment is rich in carved ornament, and directly below it the frieze is intended to be sculptured in low relief in harmony with the large panel over the front of the "forecourt" arcade just mentioned. The doors are cast bronze of verde antique finish. Each door has three panels of equal size containing bas-reliefs by Henry Lion, a local sculptor, depicting notable events in connection with the early history and settlement of southern California, and, more particularly, of Los Angeles. These doors open into a spacious vestibule with a high vaulted ceiling and walls faced with a cream colored French limestone to the spring line of the vault. Niches provided in the walls are large enough to receive statuary of heroic size. The floor is of marble in pleasing colors and geometrical designs, while the paneled and coffered ceiling is suitably decorated. The vestibule communicates, through arched openings, with the rotunda, the chief interior feature of the building, which extends up through three stories and is surmounted by a domed ceiling.

In plan the rotunda is square, except for the splayed internal angles, and is completely surrounded by generous passages connecting with the main longitudinal corridors, the elevator lobby, and secondary passages to the angle stairways and adjacent light courts. The floor is laid with colored marbles forming geometrical patterns of great variety. The central circle contains a "caravel" of cast bronze inserted in the marble, which is made to represent the sky and the ocean. The modeling is beautifully and artistically executed. All openings are triple-arched, and the supports are monolithic marble columns of different kinds, generally of dark colors, with carved capitals of light colored marble. The archivolts, also of dark marble, support the second floor galleries, which are protected with balustrades of perforated marble tracery elaborately carved. The large arched openings on four sides with the pendentives growing out of, or emerging from the splayed angles, develop naturally into the dome itself, the surface of which is decorated with highly colored glazed tile, forming geometrical patterns, on a background of acoustical tile of harmonizing tan color. The main corridors have barrel-vaulted ceilings 24 feet high to the crown, and the walls are wainscoted to the spring line of the vault with St. Genevieve marble framed in Napoleon Gray between Botticino pilasters directly below plain projecting ribs of the ceiling. The floor is of pink Tennessee marble and the base of Belgian black.



Dome of Rotunda from the Second Floor, Los Angeles City Hall
John C. Austin, John Parkinson, Albert C. Martin, Associated, Architects

From the main corridor on the south a wide passage connects directly with the council chamber fronting on Spring Street and abutting the southwest court and is well lighted by the 13 large windows and the small clerestory windows above. The council chamber has wide aisles formed by the arcades paralleling the sides. The arcades are supported by highly polished imported marble columns, of which there are six on either side, and each one is of a different variety, yet they harmonize perfectly. They are monoliths resting on solid single-piece moulded green marble bases and surmounted by carved capitals of Champville marble in typical Romanesque designs. Each of the four faces of every cap contains an emblem characteristic of one of the states of the Union. For instance, California is represented by the grizzly bear, Texas by the star, and Massachusetts by the codfish. The ventilation is thermostatically controlled, so that fresh air is kept constantly in circulation without the necessity of opening the windows. The latter are of the inward-opening casement type, constructed of rolled steel sections, and are protected with permanent heavy steel and iron grilles of conventional design painted a deep green to relieve the whiteness of the granite exterior. All glass is obscured and of amber color. Artificial lighting is effected by two lines of seven lanterns suspended from the ceiling at points several feet distant from and opposite the centers of the arcade openings. They are enclosed with amber colored glass, producing a soft, subdued glow. The furniture, which was designed by the architects. is conservatively modern and substantially constructed.

Next in importance, from the standpoint of architectural treatment, is the mayor's suite at the southeast corner of the first floor. This consists of a large reception room off a public lobby or ante-room, approached directly from a wide corridor extending southward from the east lobby. From this anteroom another corridor extends southward to an outer hall, which connects directly with the private office. Adjoining this is the retiring room, then a toilet room, equipped with shower, and beyond are the offices of the mayor's secretary and assistant secretary. The selection of the location of the mayor's office was influenced by the attractive outlook over the park or garden, on the south, the exposure to many hours of sunshine and to cooling summer breezes rendering its occupancy pleasant and comfortable at all seasons of the year.

The landings, treads and risers of the main stairways are of pink Tennessee marble with solid balustrades of a deep pink Kasota stone, while the adjacent walls are wainscoted with French and Pink

Marble Mosaic Floor of the Rotunda, Los Angeles City Hall
John C. Austin, John Parkinson, Albert C. Martin, Associated, Architects

Tennessee marble to the level of the first floor and finished with a moulded cap. Adjacent piers and pilasters are of Botticino marble. The main corridor extends through the building, on the longitudinal axis, from street to street, with secondary corridors along the north, south and west sides, parallel with those walls and a connecting corridor, on the transverse axis extending, at right angles, from the westerly corridor to the east lobby, to provide direct access to the elevators and stairways. The latter run from the basement to the third floor. These corridors have a segmental vaulted ceiling, the floors are tiled with marble, and walls are wainscoted with the same material to a height of 3 feet. The only other room treated more or less pretentiously from an architectural standpoint, is that occupying the entire area on the 25th floor where, by means of well protected balconies, reached through double doorways on each of the four sides, one can enjoy an unobstructed panoramic view of the city and surroundings, reaching from the Sierra Madre range of mountains to Santa Catalina Island and the sea, and to Mt. San Jacinto on the east.

Here are a few interesting facts connected with the building of the Los Angeles City Hall:

Bond issue of $7,500,000 was authorized June 5, 1923.

Architects commissioned August 17, 1925.

Preliminary sketches approved September 16, 1925.

Ground broken March 4, 1926.

Foundations started May 7, 1926.

Tower foundation poured June 14 and June 15, 1926.

Erection of steel framework commenced July 24, 1926.

General Contractors' operations started July 2, 1926:

Cornerstone laid June 22, 1927.

Building first occupied (by Superior Court of Los Angeles County) January 2, 1928.

Building dedicated by Los Angeles April 26, 1928.

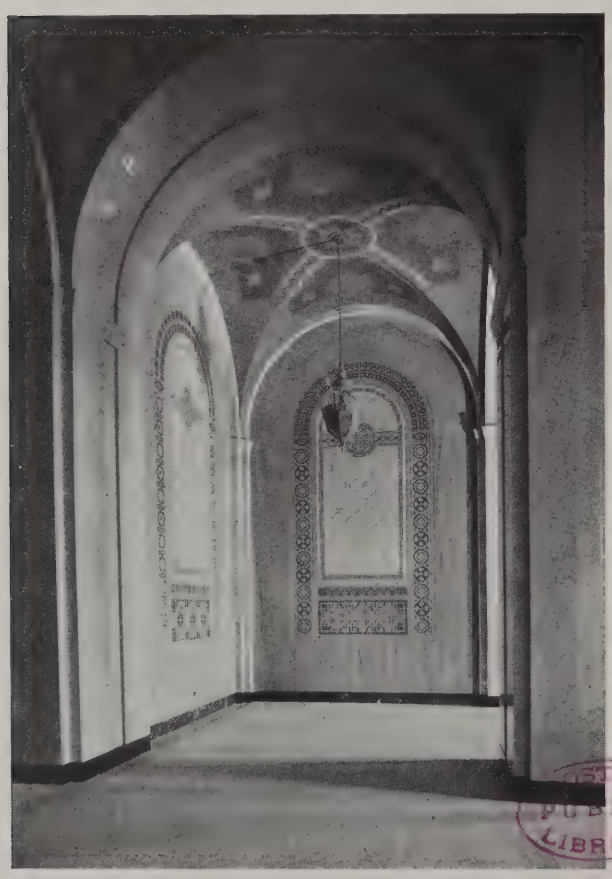
Floor space, 20 acres; volume 12,000,000 cubic feet; dead weight, 95,000 tons.

Structural steel, 8,167 tons; 900,000 rivets; 400 columns; total length of drilled holes, 12 miles.

Eleven elevators; 5-ton ice machine; 129 miles of wire; largest lighting and power switchboard on the Pacific coast; telephone switchboard with ultimate capacity of 2,000 telephones.

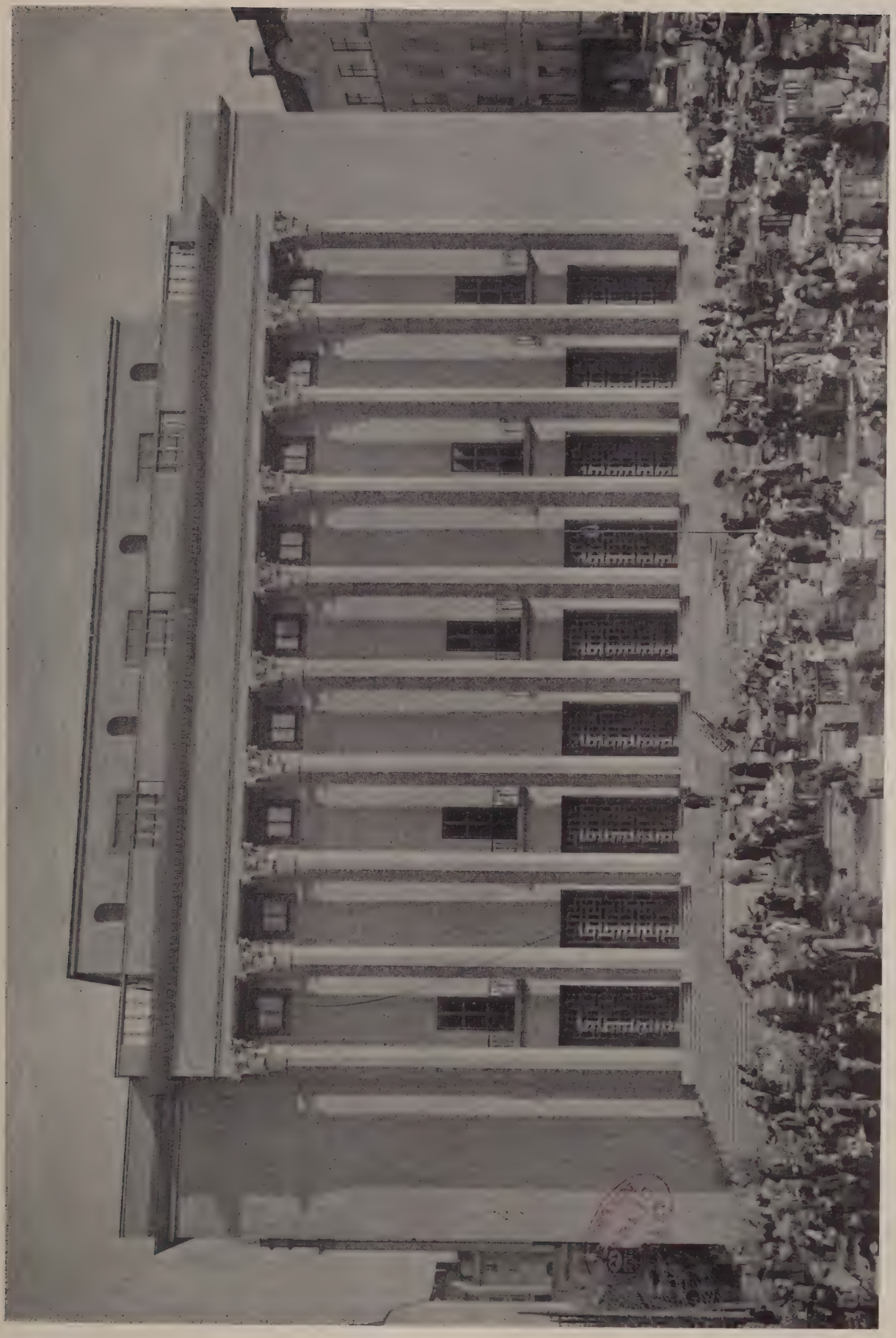
Total investment, $9,000,000, of which the building cost $5,000,000; the site $3,500,000; the decorations, equipment and furnishings $500,000.

Editor's Note. From these statistics it can easily be appreciated what remarkable efficiency in management and superintendence was furnished by the architects of this great building. The handling of this undertaking quite as much as the design of the structure and the working out of all the intricate and interesting details in construction and design reflects great credit upon the architects, who planned it.



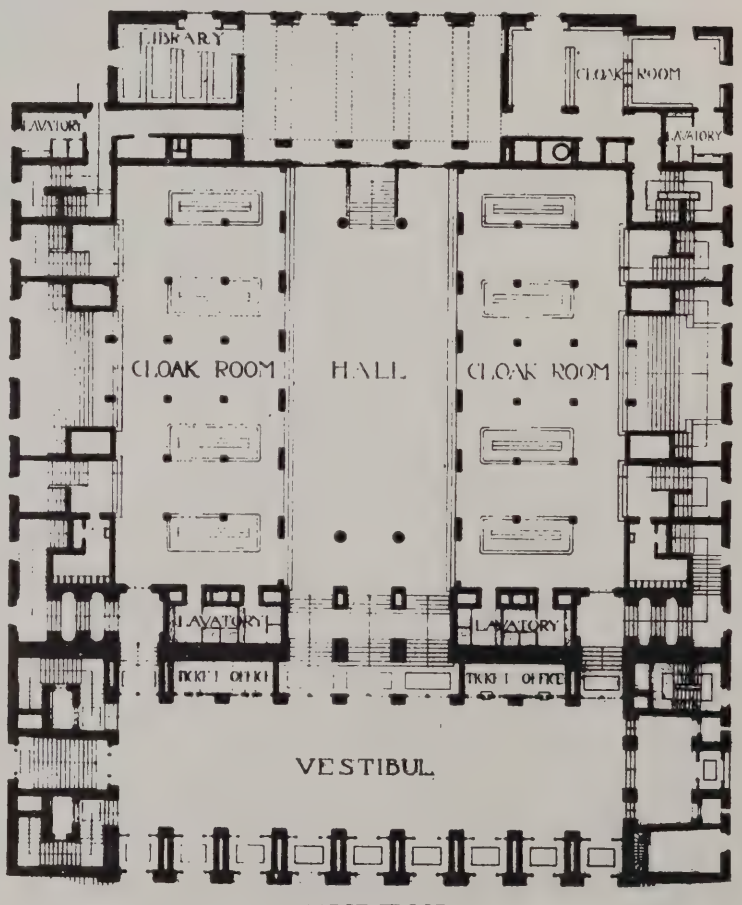
South Lobby, First Floor

North Lobby, First Floor



Plan on Back

CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



FIRST FLOOR

PLAN: CONCERT HALL, STOCKHOLM

IVAR JUSTUS TENGBOM, ARCHITECT

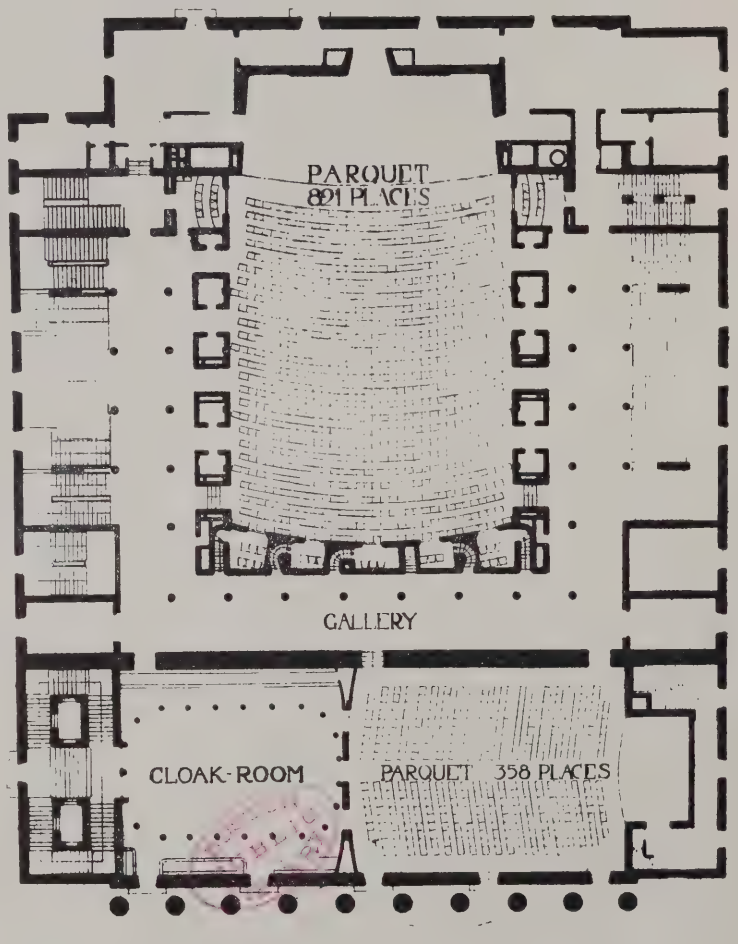
BOSTON PUBLIC

Plans Taken from "Modern Swedish Architecture"
Charles Scribner's Sons, New York

Plan on Back

ENTRANCE PORTICO, CONCERT HALL, STOCKHOLM

IVAR JUSTUS TENGBOM, ARCHITECT

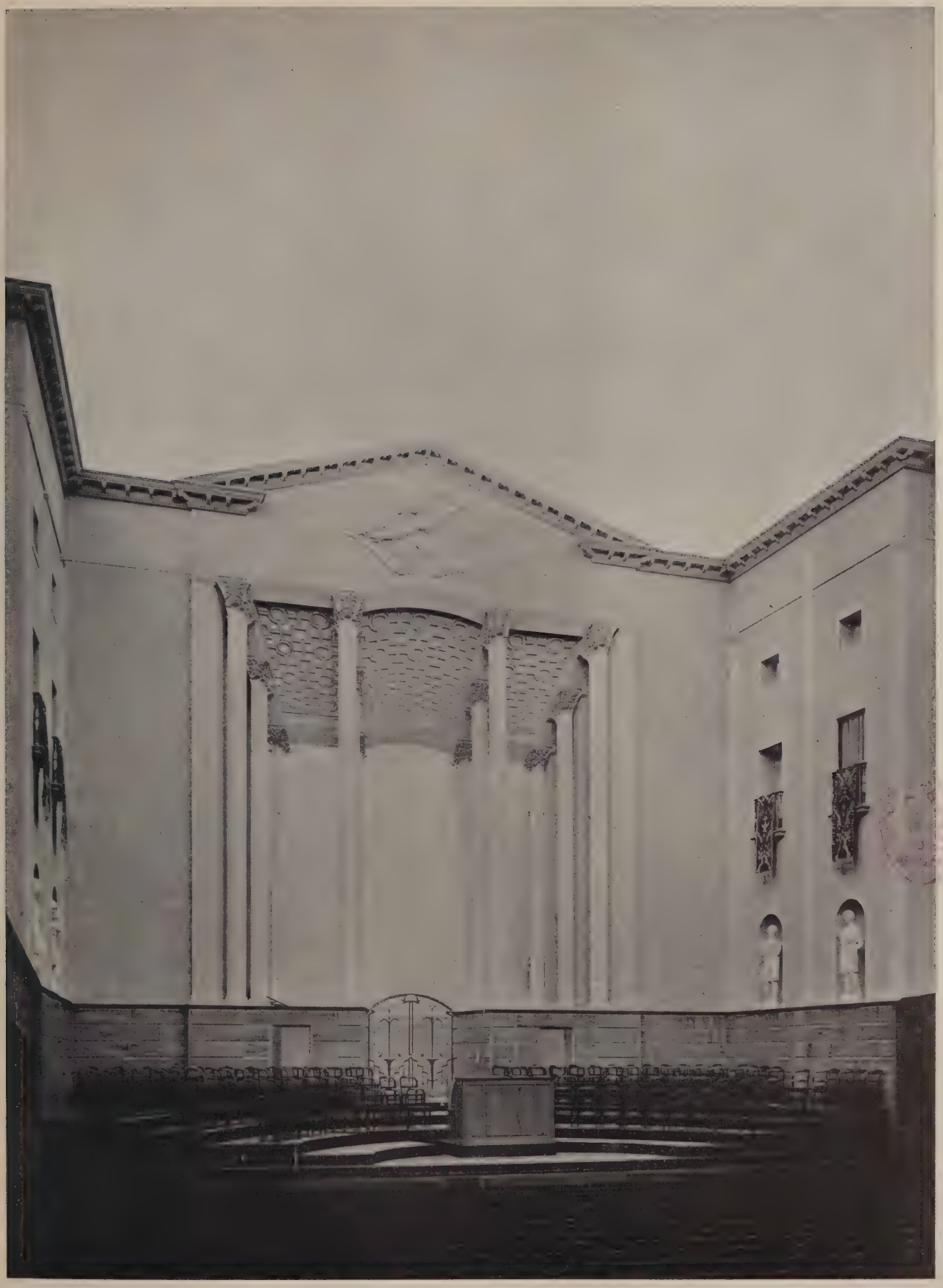


SECOND FLOOR

PLAN: CONCERT HALL, STOCKHOLM

IVAR JUSTUS TENGBOM, ARCHITECT

ENTRANCE FOYER, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



ORCHESTRA PLATFORM, LARGE AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

LARGE AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

SMALL AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

BUILDING FOR CHARLES H. BEAN & CO., PHILADELPHIA
TILDEN, REGISTER & PEPPER, ARCHITECTS

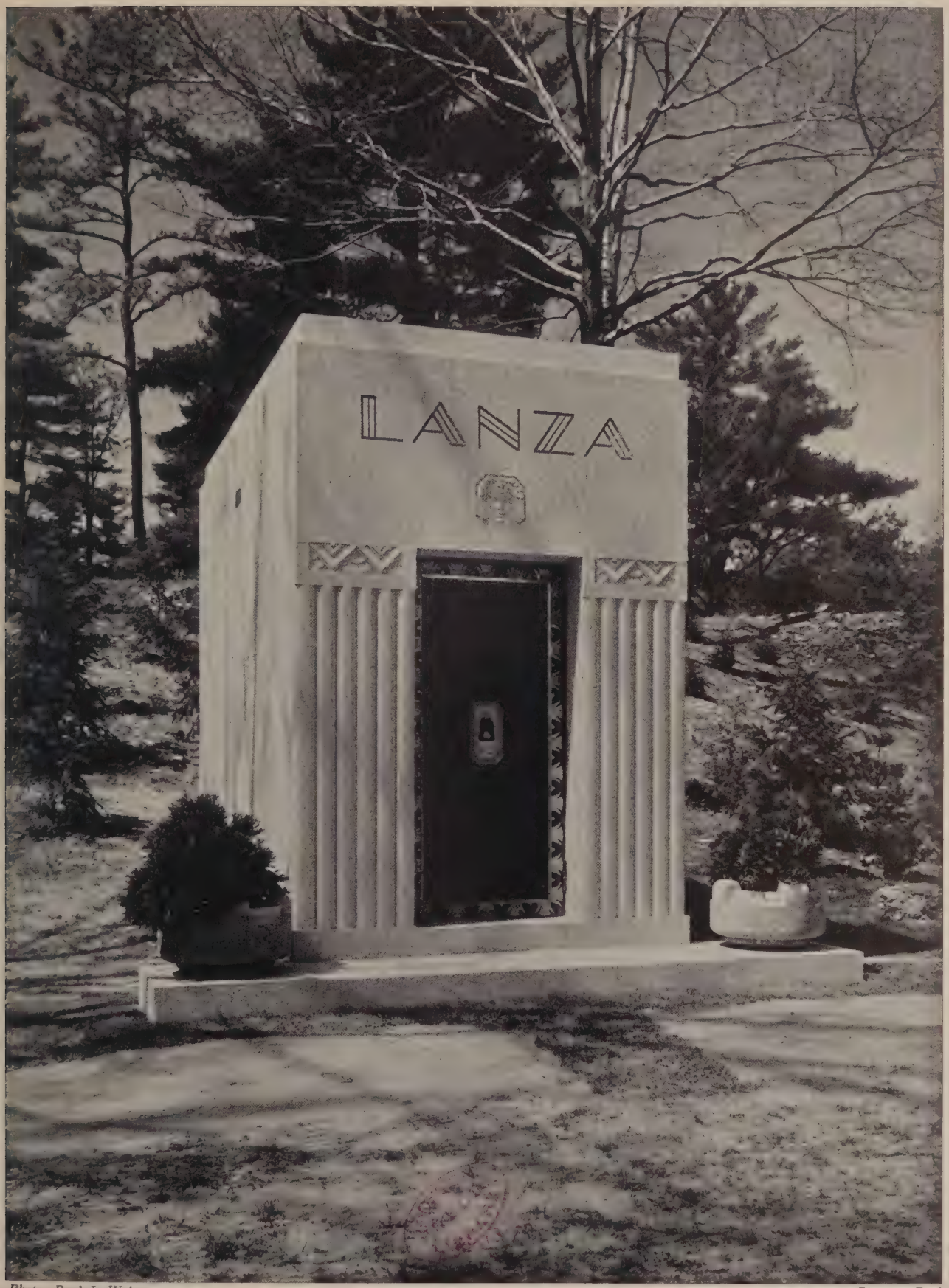
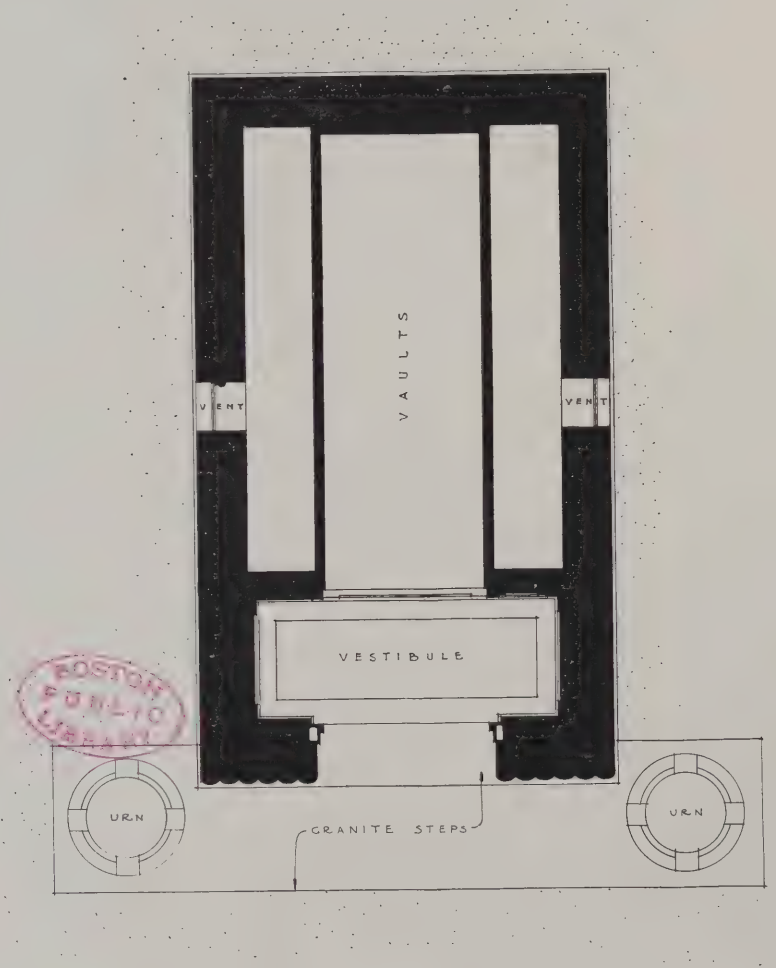


Photo. Paul J. Weber *Plan on Back*

MAUSOLEUM FOR C. C. LANZA, ESQ., FOREST HILLS CEMETERY, BOSTON

EDWARD F. ALLODI, ARCHITECT



PLAN: MAUSOLEUM FOR C. C. LANZA, ESQ., FOREST HILLS CEMETERY, BOSTON

EDWARD F. ALLODI, ARCHITECT

AN ARCHITECT IN MOROCCO, PART II

BY
EUGENE F. KENNEDY, JR.
ROTCH TRAVELING SCHOLAR

HOW unfortunate we are in not being able to to enter the courtyard of the Grand Mosque of *El Kairouine!* The hasty glimpses we steal, through any number of its 14 doorways, give us but a vague idea of the magnificence of those spouting fountains, under the lacy pavilions at the narrow ends. Alas! the hordes of contaminated beggars, who haunt the doorways, form an impassable barrier, so continuously do they guard the temple of worship in their efforts to keep unbelievers at bay!

From the restless surging of the noisy streets, an occasional palace garden offers the peaceful contentment of a jasmine-scented oasis. Multitudes of flowers greet our eyes, while orange and lemon trees tempt us with their luscious fruit. Sparkling fountains send cooling jets of water high into the fetid air, and tiny murmuring rivulets run in ceramic channels bordering each path. This surely is the Garden of Paradise,—even the white *burnoosed* gardeners bear a striking resemblance to angels, who have, in some way, mislaid their wings.

Resolutely turning our backs to this scene of sensuous serenity, we climb the steep hill which leads to the cemetery of *Bab Fetouh.* If it be on a Friday that we make this excursion, an interesting experience lies in store for us, as this is the one day of the week when the women visit the graves of their departed husbands. At first we see nothing but indistinguishable mounds of white, until finally some of these take the form of scattered grave stones, while others—more numerous—are the squatting figures of voluminously clothed women who are—to all appearances—rapt in devout prayer, but incidentally—I don't doubt—enjoying this opportunity to gossip. Groups of children, guided by their austere teachers, pay visits to the *marabouts* of the holy men, giving the impression of a flock of chickens following the mother hens, as they waddle from tomb to tomb. Fez completely captivates us. We can never know it, never become tired of it, or bored with it. Weeks roll by, leaving us as ignorant of all its strange beauties and mysteries hidden away in the labyrinth of streets, as we were upon first entering it. Its indescribable filth and contamination, its sickening odors and nauseating sights detract no whit from its picturesqueness. On the contrary, they serve to magnify the beauty and intensify the fascination of this "Pearl of Morocco," as it is called.

Meknes, a few hours west of Fez, is no less beautiful, nor less interesting than Fez. Here again we see the same throngs, and like odors and sounds assail our nostrils and ears. Minarets, similar in design to those we have seen, rear themselves above the housetops. We are continually discovering the same fountains that we remarked at Fez. Despite these resemblances, Meknes has an air different from that of the capital city. It has been called the Versailles of Fez and, like the true Versailles, it is vast and unrestrained. The crampedness of Fez has been left behind, and here we find that the streets are wider, more comfortable, and that large open squares are not uncommon. The principal square is an enormous affair, over 200 yards long, and more than half as wide, surrounded on all sides by high blind walls, and pierced only by a few huge portals. On the east end are two, and one of these, that of *Mansour el Aleuj,* is undoubtedly the most beautiful and perhaps the most monumental and imposing piece of architecture in all Morocco. The high archway, through which there surges a constant stream of people, is guarded by two square bastions supported on arcades. It is resplendent with tiles of blue and green arranged in panels between the brickwork designs, or into colorful friezes and bands. Opposite it on the west side of the square is a long fountain built against the wall. Like the other smaller fountains, it is composed of innumerable pieces of small tiles of various colors, arranged in the most intricate of designs. This is shielded from the weather and the scorching rays of the sun by a wooden canopy delicately chiseled and showing scarcely any trace of the brilliant colors with which —at one time—it was covered. To this most gorgeous of fountains come the most disreputable of men and beasts to partake of the cool waters which it offers, affording a refuge from the stifling heat.

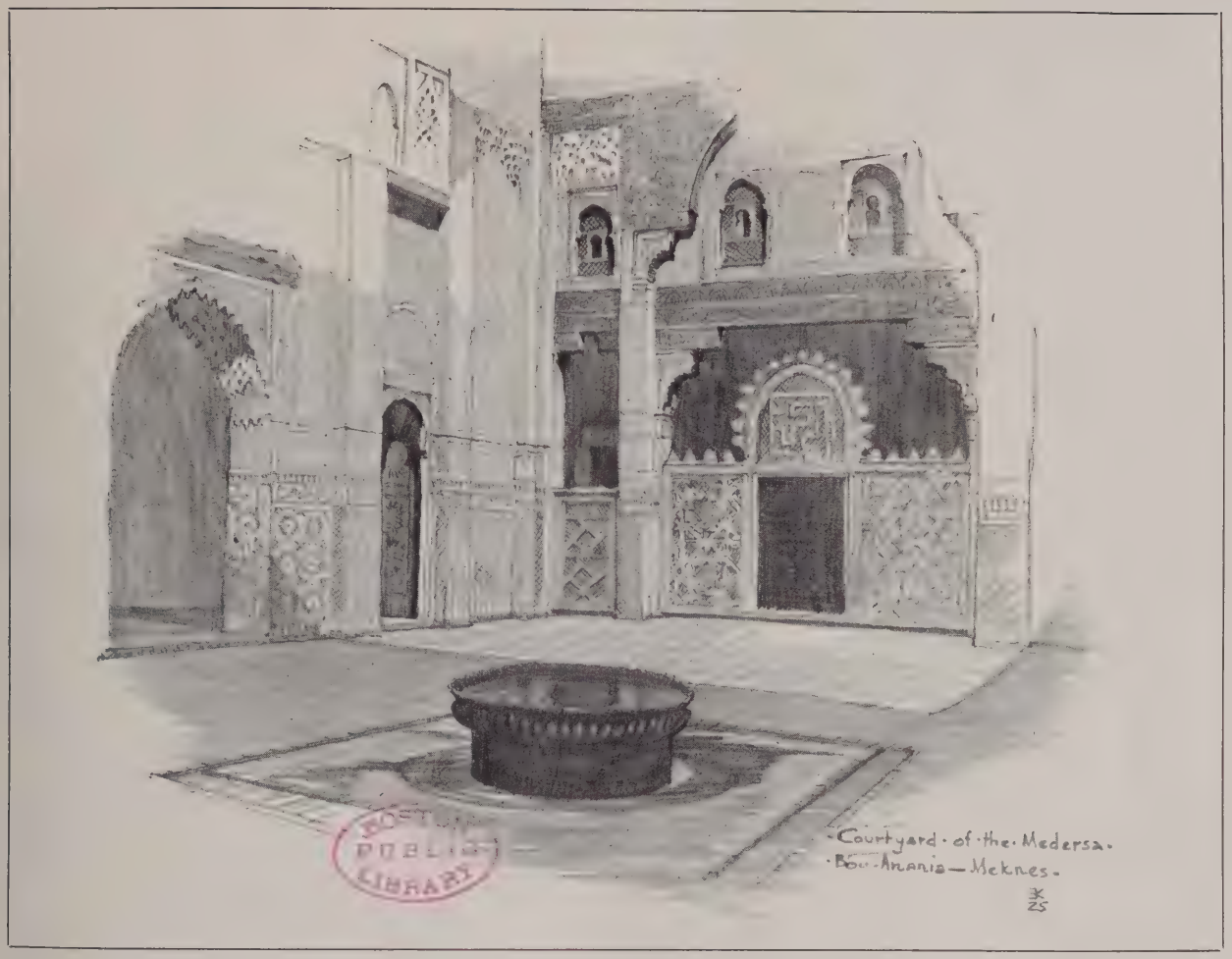
Perhaps we shall be fortunate enough to see the square on a market day when it is overflowing with boisterous merchants and wrangling buyers. The snake charmers squat against the long walls, surrounded by a semicircle of intent bronze and black faces, and blow shrill tunes through reed pipes to the evident delight of a wicked-looking but harmless serpent. Still another silent, interested group squats around an old white-bearded native who reads to them from the Koran, or recounts some of the oft-repeated tales of Scheherazade. These silent groups are strikingly like uncanny calm spots in the midst of a restless, roaring sea. Many are the beauties of Meknes, many unique to her only; many we have remarked at other places, but I hesitate to go any further in describing them for fear of repeating what I have already said,—and because as we have by no means seen all of Morocco, we must push onward, for there are still other treasures beyond.

Rabat is the seat of the Cherifien Empire. It is here that the sultan holds his court, and here also that the governor-general, who is the veritable ruler of Morocco, has his residence. The extensive European renovations have almost entirely ruined the

Fountain at Nejjorine, Fez-el-Bali
From a Pencil Sketch by Eugene F. Kennedy, Jr.

oriental flavor of the place, even within the native quarters, where we find but little to interest us save perhaps the ancient *Kasba,* a fort which presents to the sea a stern, forbidding front, but which in reality protects nothing more than a delightful Moorish garden and museum. Not distant, however, from the edge of the European town, rise the lonely, austere walls of the ancient city of Chellah. The walls are nearly intact and of a gorgeous reddish hue that is dazzling to the eye when seen in the strong sunlight. It is pierced by a wondrous solitary portal of a similar stone, flanked by two hexagonal turrets and carved and decorated, after the fashion of the Moors. Here, however, the carving is much coarser than that of the inland cities, due perhaps to the use of stone rather than of brick and tile, and perhaps because the natives of the famed Barbary coast were a hardier race than their less piratical brethren of the interior. The desolate air of the place fills us with awe. No trickling stream of colorfully clothed natives comes through the archway. There is not a sign of any life except for one lonely shepherd who leans upon his long staff, seemingly oblivious to the wanderings of his scattered herd. We enter, half expecting to see the usual busy street scene, but there is none of that, not even the inevitable beggars who, squatting in the cool shade of the archway, beg pennies in exchange for the bounteous blessings of the most potent Allah. Nothing! Nothing but a riotous mass of trees, unkempt shrubbery and rolling grassy hills, until we suddenly discover the shaft of a graceful minaret away to the right, hardly visible through the maze of foliage. Only when we come directly upon it do we find any signs of human habitation, and then only a few hovels clustered about the minaret, the tiny mosque, and a deep, wide well. The city, if ever there was one enclosed within these ruddy walls, has completely disappeared as if swallowed up by the earth. There are not even the usual piles of rubbish, generally associated with ruins of any sort, to permit any fanciful—or somewhat idle—speculation as to what might have been.

Directly across the mouth of the river from Rabat lies its twin sister, Sale, twin sisters only because they are side by side, for in appearance they are widely different. Sale was never blessed (or cursed) by an inroad of infidel Christians, and has consequently preserved its oriental character. I am not going to make any attempt to describe Sale, though it is not uninteresting and boasts an occasional beau-



Courtyard of the Medersa, Bon Anania, Meknes
From a Pencil Sketch by Eugene F. Kennedy, Jr.

ty spot in the shape of a *medersa,* mosque or portal. If for nothing else, it has lost much of its beauty by the zeal of its inhabitants in keeping it a spotless white. So many coats of whitewash have been applied to its walls, that now, I don't doubt, the town is larger by some feet, though its streets are narrower by a few inches. In itself this is no sin, and the white city is certainly most quaint, but in many cases the whitewash has filled in the crevices of the carvings, and made of the crisp mouldings blunt, undulating bands, with little architectural character.

No Moroccan trip begins to be complete until Marrakesh has been visited and studied. Here is a city that rivals in size and splendor the magnificent Fez and Meknes of the north. Primarily it has a different atmosphere from either of its northern sisters, and presents an ensemble that more closely agrees with our imaginative pictures of what a Moroccan city should resemble. Numerous palm trees (missing in the north) give it that air of tropical voluptuousness one finds in a verdant oasis in the middle of the Sahara. The masses of people are as varied and as interesting as elsewhere,—perhaps more so,—for here we find the men of the desert. Trains of camels enter and leave its many portals, carrying with them romance and adventure to remote parts of this desolate world. Its palaces are unsurpassed in beauty and magnificence, while its gardens seem to be more exotic than elsewhere. *Medersas* of sparkling splendor are scattered here and there. Beautiful doorways and tall minarets continue to attract our attention in our journeys through its streets. In fact, nothing is missing that we found at Fez or Meknes. There is, as a matter of fact, more apparent,—not requiring discovery.

Taken altogether I know of no spot in the old world where the interest is so intense as in Morocco. As soon as we have first entered its borders, we are transported into a new sphere; we are carried back to bygone years not as at Carcasonne by our imagination in viewing its hoary walls of the middle ages, but by the very life and customs of its inhabitants, as well as its monuments; one feels as out of place amid these *reliques* of a distant century as undoubtedly Gulliver felt in the land of the Lilliputians, and strangely enough we are wont to associate Washington Irving's "Tales of the Alhambra" more with Fez or Meknes than with the empty halls of the "Ambassadors" or the Court of the Lions in Granada. It is one of the homes of romance left to the world.

UNIVERSITY EXPANSION AS TYPIFIED AT HARVARD

BY

CHARLES G. LORING

MANY educators question the wisdom of rapidly expanding our school and college plants, claiming that the buildings overshadow the importance of the teaching staffs, that the cost of bricks and stones means curtailing salaries, and that the vital, human essence is diffused,—not strengthened. The acceleration in the output of "bigger and better" public schools, private academies, state colleges and endowed universities is universal from coast to coast, and the evolution of pedagogic theories and of architectural styles is correspondingly speeded up. There is no private scrool or college but has alumni boosting for new buildings or exhausted by a successful drive!

THE ARCHITECTURAL FORUM in the October and December issues published monographs on the new Graduate School of Business Administration and on the new Fogg Museum at Harvard, two costly symbols of the expansive tendencies of the times. In terms of square feet of area and in the number of buildings, the plant in Cambridge has more than doubled in the last 25 years. The ground built over since the end of the nineteenth century is 133 per cent of that covered during the nineteenth century, and these figures do not include structures, like the Medical School, built at a distance from the center.

Unlike Yale and Princeton, where the transformation has also been rapid, Harvard has not "gone Gothic"; there are no dream towers against the sky, like those of Harkness or the Graduate School. Perhaps the near-Gothic "remains" left standing from the Civil War period, that false dawn heralded by Ruskin, are reason enough to cling to the earlier, indigenous traditions! The Colonial, the "Cambridge Georgian," the red brick and white trim, are the accepted mode along the Charles River, and year by year they offer new combinations of a familiar alphabet. The corporation has of recent years commissioned but one firm of architects for all its designing, except where a munificent donor has imposed his own wishes. The excellence of the new Fogg Museum and of the recent groups of freshmen and yard dormitories has shown the wisdom of the choice, while the domineering lack of scale of the Widener Library emphasizes the exception.

The small scale of Colonial, its domestic quality, is admirably suited for dormitories; witness Massachusetts Hall, two centuries old, or McKinlock, opened last autumn. The style is sufficiently elastic to be varied and yet kept harmonious, as in the freshmen dormitories. The easy freedom of this group, strung along the north bank of the Charles, is in strong contrast to the tight and monotonous repetition in the students' quarters of the business school facing the parkway on the southerly shore. In mass and texture, in charm and dignity, in everything except group planning, the college units outrank those of the Baker Foundation. It might be claimed that allowances should be made for the lack of trees shown in the entrancing perspectives by Steffins, for the proposed arcades linking the buildings, or for the cupolas on Hamilton and Mellon Halls, called for by the architects but excluded by the budget; yet the fact remains that the business school is today being judged by its present appearance and not by what it may be in the future. Viewed from the Cambridge shore, there is just a suggestion of "quantity production" in the two, 300-foot long facades which face the river, and on closer inspection the stiff, vertical lines of the quoins, where concrete is painted a flat white, suggest the factory rather than academic shades. Elements contrasting in mass and color, the smaller stucco halls, flanked by arched gateways, and the proportions and variety in the administration building, especially its rear elevation, are the most successful features.

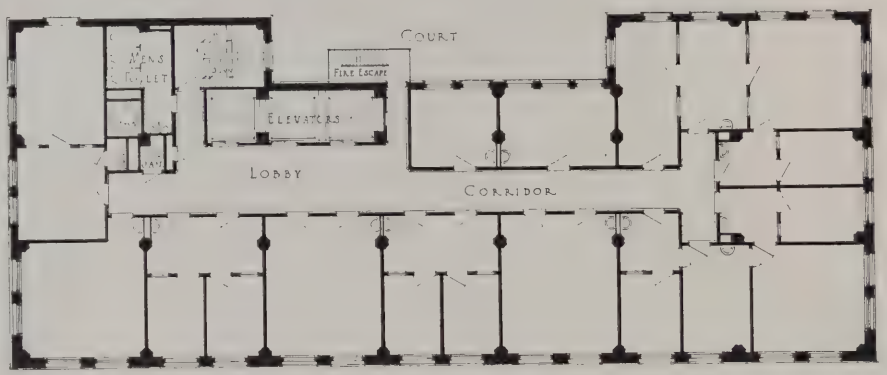
The business school library is the focal point of the composition and has a straightforward dignity and functional expression, but in the windows the shallow reveals and slender muntins, combined with the necessary but over-large expanses of glass, impair the monumental quality. This building and the Museum are contemporary, very similar in the sizes and shapes of the plots covered, and each has 16 openings on the main floor facade. It is therefore natural to contrast these divergent interpretations of the same historical period. In the Museum, where there is overhead lighting, on the second story there are only eight relatively small windows, and the openings on the main floor have not only less area than those in the library but have smaller lights of glass heavily framed in white. In the Museum all the subordinate details, whether the iron handrails, the central fanlight, or the carved ornament are more robust and vigorous. The library of the business school is frankly the central workroom of its group. The college Museum is withdrawn a bit from the university; its facade bespeaks the safeguarding of beautiful objects; the very brick and stone and wood are combined in a quality of restrained opulence. The rear of the library has conspicuously temporary segments of wall for future expansion; it is ready for a bigger business school, but the back of the Museum is much more surprising. The front facade is two stories in height, with a basement masked by a grassy terrace, while the rear wing is five flights high,—a finished and studied university building, with almost the air of a refined apartment house.

Truly, John Harvard and the puritanical forefathers of the college would be astounded at its growth and could never have conceived its extent.

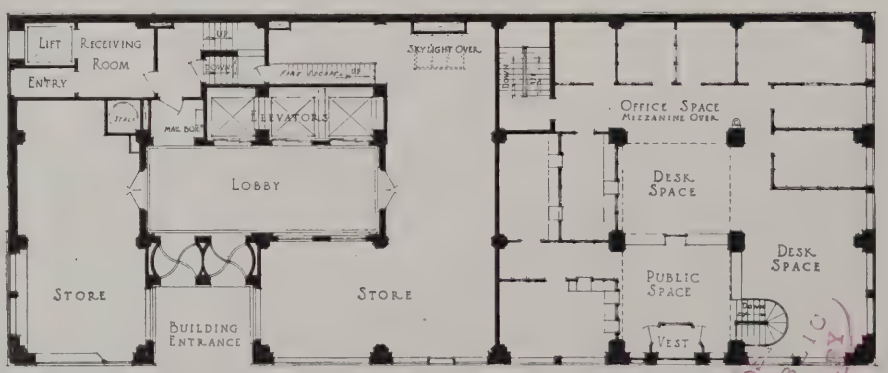
Photos. Laura Gilpin *Plans on Back*

SECURITY BUILDING, DENVER

W. E. & A. A. FISHER, ARCHITECTS



A TYPICAL FLOOR



STREET FLOOR

PLANS: SECURITY BUILDING, DENVER

W. E. & A. A. FISHER, ARCHITECTS

BOSTON PUBLIC LIBRARY

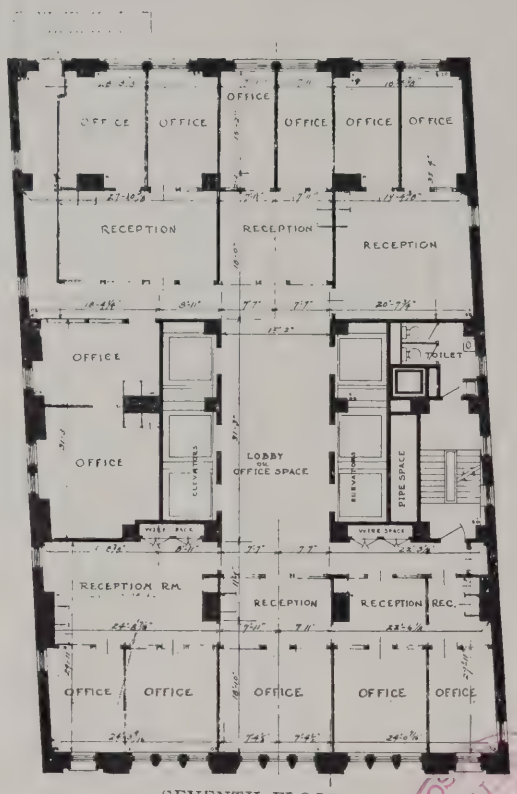
DETAIL, UPPER STORIES, SECURITY BUILDING, DENVER
W. E. & A. A. FISHER, ARCHITECTS

Photo. E. L. Fowler

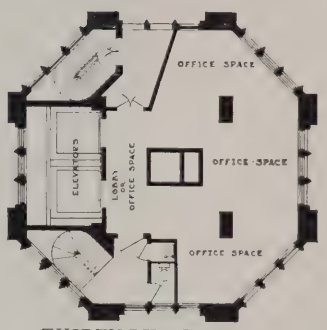
Plans on Back

THE MATHER TOWER, CHICAGO

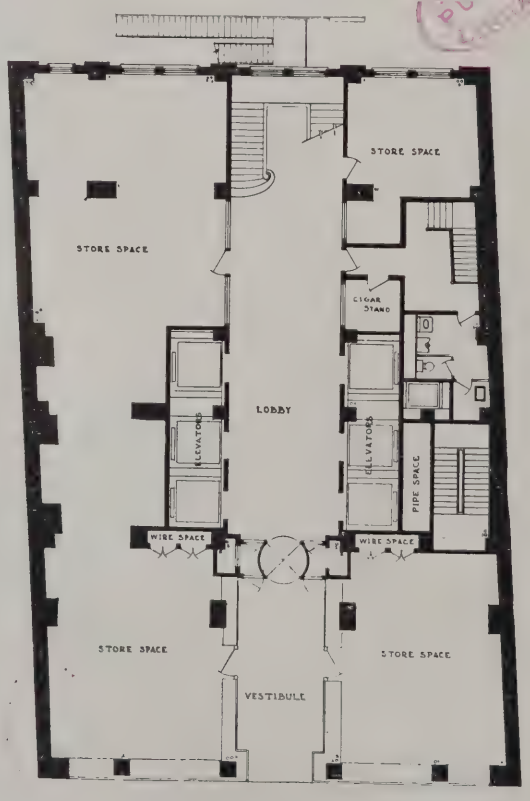
HERBERT HUGH RIDDLE, ARCHITECT



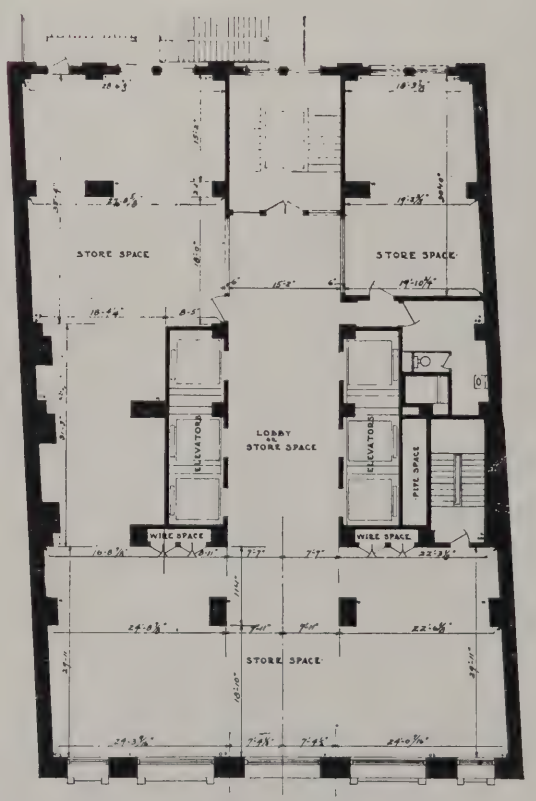
SEVENTH FLOOR



THIRTY-THIRD FLOOR



FIRST FLOOR



SECOND FLOOR

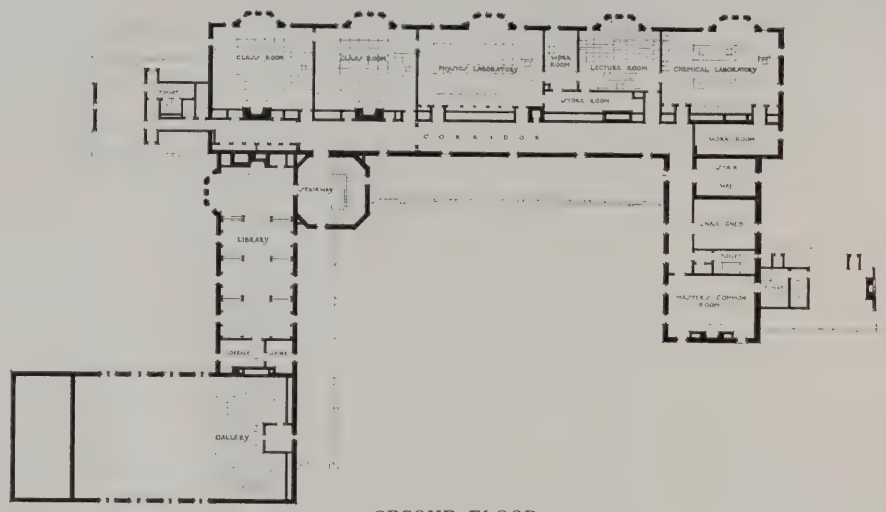
PLANS: THE MATHER TOWER, CHICAGO

HERBERT HUGH RIDDLE, ARCHITECT

ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS

Photos, Paul J. Weber

Plans on Back



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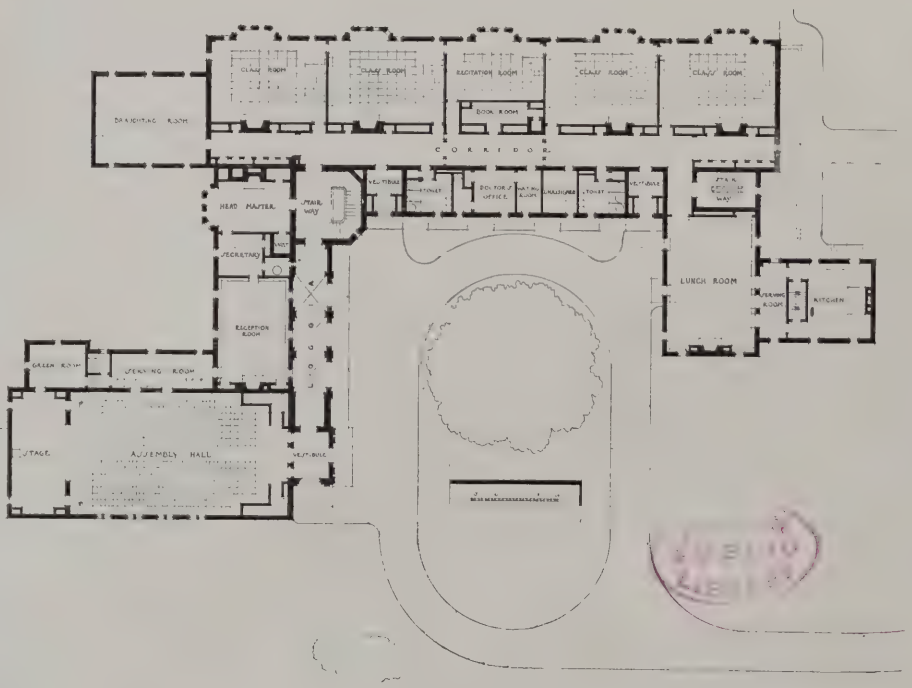


FIRST FLOOR

PLANS: ROXBURY LATIN SCHOOL, DEDHAM, MASS.

PERRY, SHAW & HEPBURN, ARCHITECTS

DETAIL, ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS

ENTRANCE DOOR, ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS

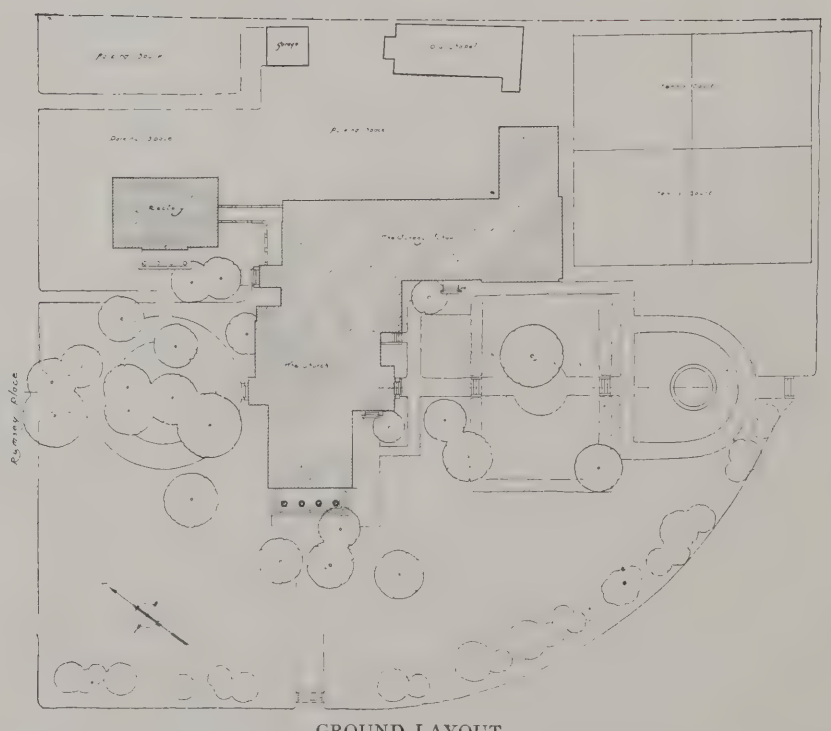
From a Rendering by Otto R. Eggers

FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

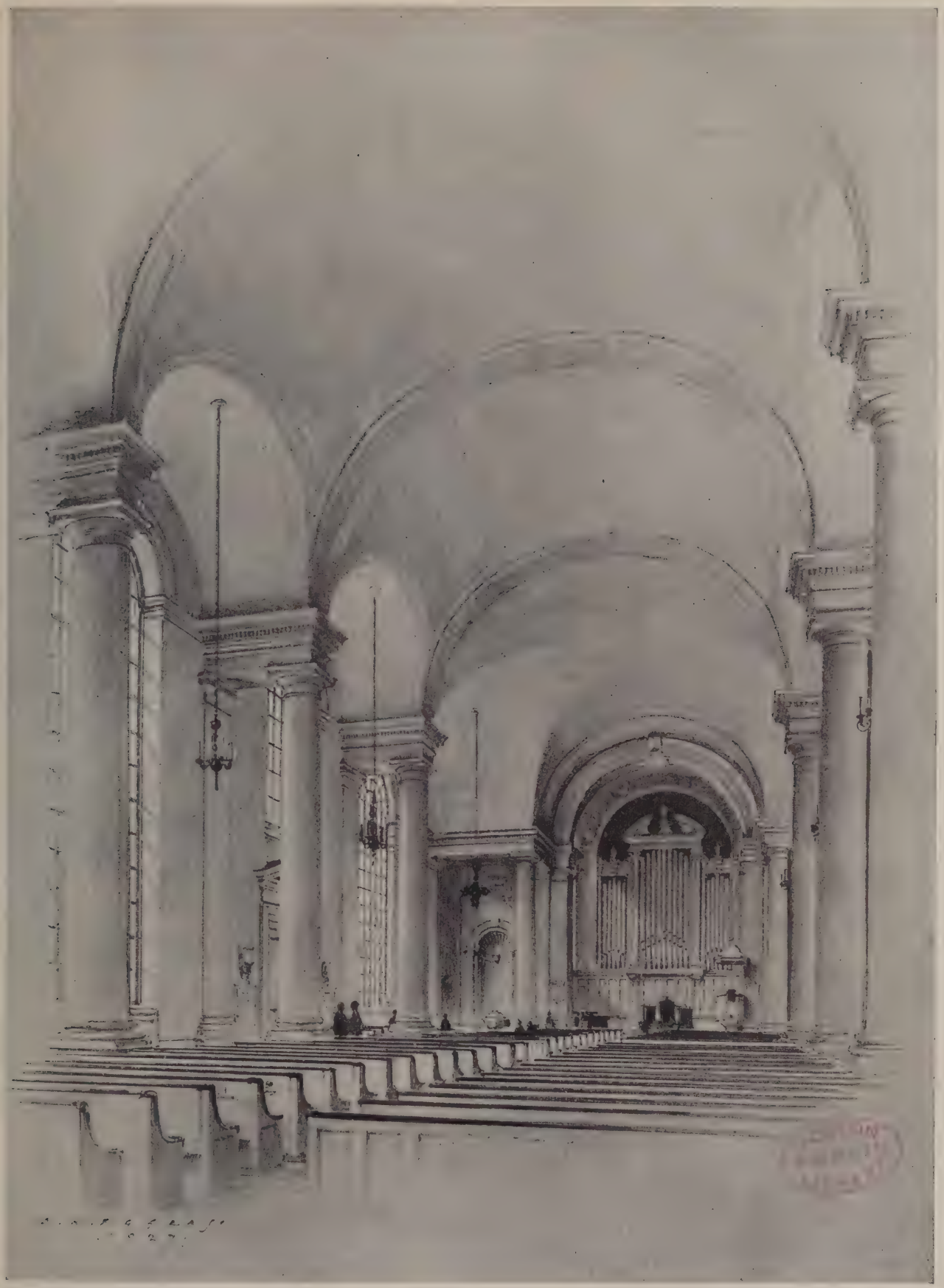
Plans on Back

BASEMENT



GROUND LAYOUT

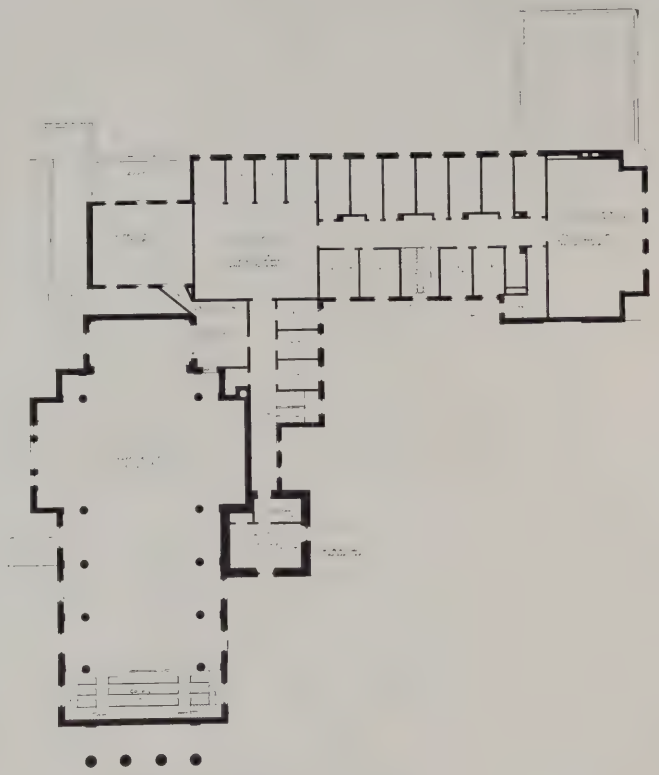
PLANS: FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



From a Rendering by Otto R. Eggers *Plans on Back*

FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT



SECOND FLOOR

FIRST FLOOR

FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

OUTPOSTS OF ARCHITECTURE

MONUMENTS MARKING HISTORIC SPOTS ON THE GREAT NORTHERN RAILWAY

ELECTUS D. LITCHFIELD, ARCHITECT

BY

MATLACK PRICE

POINTS of historic interest have been marked, generally, in a very sporadic manner,—here and there and now and then. To carry out a consecutive program of marking a series of historic spots has been the unique and highly commendable plan of the Great Northern Railway. This railroad's president, Ralph Budd, sponsored the organization, in 1925, of the Upper Missouri River Historical Expedition, a tour of historians, writers and officials to historic spots where commemorative monuments were to be dedicated. And these monuments have not only been the means of paying a tribute to the hardihood of these early pathfinders who opened up the Pacific northwest, but also that of directing public interest to the historic background of the territory traversed by the railroad, extending through several states.

Much comment, certainly, was brought forth from northwestern newspapers. The *Spokesman-Review*, of Spokane, recognizing the practical aspect of the Great Northern's memorial building, said: "Getting away from the altruistic idea of bestowing honor where honor is due, there is a distinct advertising value in monuments and markers that actually recalls the scenes and facts of historical events. These make a peculiar appeal to the tourist. He is attracted by publicity concerning them, and the interest of his visit is enhanced by their perusal upon his arrival. It is good business to create and maintain shrines of

Monument to the Lewis and Clark Expedition at Meriwether, Mont.
Electus D. Litchfield, Architect

patriotism and historic significance," in which paragraph this newspaper made a very definite point, and showed itself to be more practical and less sentimental than most newspapers are when any kind of a memorial is being discussed. The *Minneapolis Journal* said: "Patriotism has no firmer foundation than a proper appreciation of the achievements of our predecessors." And the *Anaconda Standard* gives another angle of the thought conveyed by the paper in Spokane: "Sentiment has indeed come to be an integral part of the modern business structure. Sentimental considerations observed by many business institutions bring to them a measure of respect and sympathy,—a comradeship from the public,—that mere success and fair dealing cannot engender. Recent action of the Great Northern Railway Company in leading the way to a more general dissemination of knowledge of the early history of Montana

The Travel and Trade Route Monument at Bonner's Ferry, Idaho
Electus D. Litchfield, Architect

and the northwest is a sentimental business activity which is bound largely and vitally to benefit this commonwealth while redounding to the credit and increasing the respect for the railway company."

Considering the simplicity of pioneer ideals, of the lives of the men whose deeds are commemorated by the Great Northern's monuments, the architect, Electus D. Litchfield displayed admirable taste in the simplicity which is the keynote of his various designs. Nothing could be more appropriate than the sandstone shaft at Meriwether, Mont., marking the most northerly point reached by the Lewis and Clark Expedition in Lewis' detour to explore the Marias River. Although that famous expedition is much a matter of history, a paragraph or two here will be valuable. It was in April, 1805, that the expedition set out from St. Louis into really wild country, westward. Today, leaving Williston a traveler on the

Monument to the Pioneers, Lewis, Clark and Thompson, at Wishram, Wash.
Electus D. Litchfield, Architect

Great Northern Railway follows very nearly the same route blazed by Lewis and Clark,—600 miles to Butte, one of the southern terminals of the railway,—but he covers the distance in 20 hours where the pathfinders spent four months of toil and privation to make it. But they were also making history. "This was the first official exploring expedition sent out by the American government. Its significance in our national history cannot be over-emphasized; where Lewis and Clark led, the population of an empire has followed." Returning from the Pacific coast, the party split into two separate exploring ventures. Lewis undertook to follow up the Marias River, which he believed to be an important tributary to the Missouri. When he reached a point where the Marias bent toward the southwest, he made camp. It was the most northerly point reached by the expedition, and about two miles west of the present station of Meriwether on the Great Northern Railway, which has marked it with a pink sandstone obelisk. The monument is characterized by simple, rugged dignity. On the base is inscribed: "Lewis and Clark Expedition, and on the shaft is carved:

July 26, 1806
Farthest Point West
on Capt. Lewis' Trip
Up The
Marias River

There is a fine dignity in this simple monument. In so vast an expanse of country the more ornamental aspects of architecture become trivial, and the architect does well to exercise the utmost restraint in design. This Mr. Litchfield certainly has done, and once more affirmed the axiom that good architecture must, necessarily, mean good taste and simplicity.

Somewhat in the same manner is the unusual monument at Wishram, in the state of Washington, near Glacier National Park, and on the Columbia River. On a plain base is mounted a dual column of natural formation, taken from a nearby cliff where these shafts break from the rock as though hewn by hand. Mr. Litchfield has relieved the severity of the natural rock with "lashings" as of rope, in bronze, and a bronze tablet with a list of 42 names is dedicated "To the Memory of those Dauntless Pathfinders and Pioneers Who Followed the Great Thoroughfare of

Monument to David Thompson at Verendrye, N. D.
Electus D. Litchfield, Architect

the Columbia at This Place." The first two names are those of Lewis and Clark, and the third that of David Thompson, that hardy cartographer and trader to whom a special monument stands at Verendrye, N. D.,—one of the most interesting of the series.

Much more conventional is the monument at Bonner's Ferry, Idaho, on the Kootenay. This spot, too, was visited by David Thompson, whose name heads a list of nine, below the inscription, which reads:

1808 1926
To Commemorate The
First Route of Travel
And Trade Across What
Is Now The State of Idaho

The bas-reliefs, modeled by Gætano Cecere, are elaborately symbolical,—a modern version of "attributes typifying the Indian and the pioneer,—most interesting in design and satisfying in scale and relationship. The whole idea of the monument is so simple that it easily carries this detail without being in any danger of seeming sophisticated or over-designed. Standing closer to the haunts of men than some of the other memorials, the spirit of the "great open spaces" is not felt as an essential in its character, as in the case of certain other monuments.

In a very different setting, however, is the monument to John F. Stevens at Marias Pass, which is the lowest northern pass over the Rockies. Here, at Summit, on the southern boundary of Glacier National Park, there stands a bronze figure of heroic size, commemorating a feat of personal hardihood not excelled by any of the great exploits of earlier pioneers which are recorded in these memorials.

On the base a simple inscription reads:

John Frank Stevens
December 11, 1889

Between those lines there is a story to read. In 1853 Marias Pass was sought by Isaac L. Stevens (not related to the subsequent discoverer), but he failed to locate it because a subordinate, to whom the venture had been assigned, returned unsuccessful, daunted by the superstitious refusal of the Blackfeet Indians to furnish a guide. This tribe had long believed Marias Pass to be infested with evil spirits, a belief still active when John F. Stevens came on the scene in 1889, destined to frustrate much effort.

BOSTON PUBLIC LIBRARY

Monument to John F. Stevens at Summit, Marias Pass, Wash.
Electus D. Litchfield, Architect

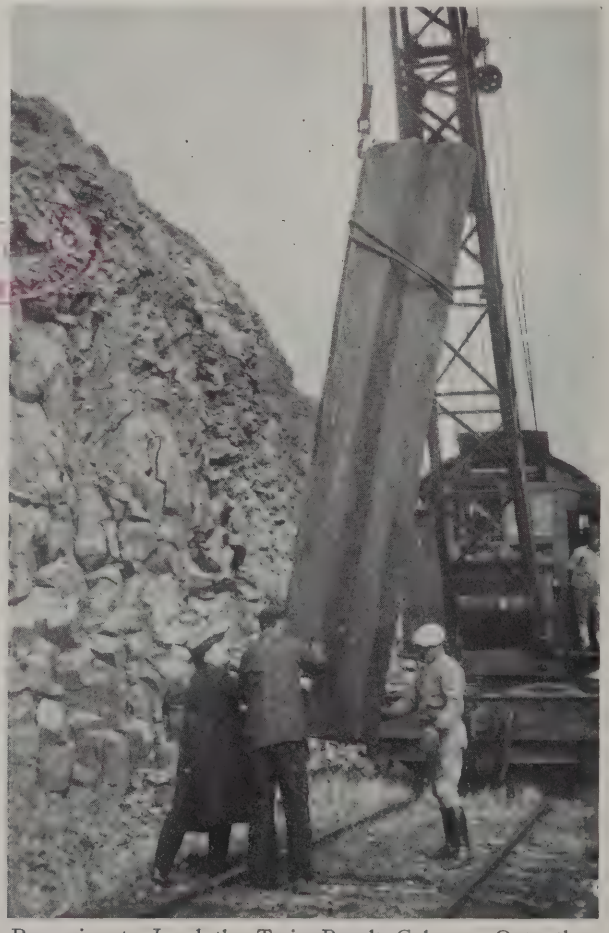
The Great Northern, then known as the St. Paul, Minnesota & Manitoba, had got as far as Helena, Mont. and sought a pass of grade as favorable as possible to cross the Rockies and push on westward. John F. Stevens became principal assistant engineer in 1889, and soon chief engineer and general manager. And it was in midwinter, 1889, that he set out in search of Marias Pass, starting from Fort Assiniboine, seven miles southwest of the present city of Havre, on the Great Northern Railway. Unable to get a Blackfoot Indian guide who would brave the spirits. Stevens found a Flathead Indian who was willing, but within striking distance of the goal this man, too, refused to go on,—and Stevens went on alone. Some idea of the nature of the country may be had from the fact that Marias Pass had remained undiscovered by white men for more than a quarter of a century,—and now Stevens was able to lead his railroad across the mountains by a route which, from the engineer's viewpoint, is the lowest and best of all the passes in the northern states. The courage, the sheer hardihood of the man's achievement is expressed in the great bronze figure, facing resolutely forward on the trail,—a monument of inspiration, through the largeness and simplicity of its treatment.

At Verendrye, N. D. there is another monument. It consists of a large stone sphere, mounted on a plain plinth. The sphere is marked off with latitude and longitude, and its original design called for an applique of continents in bronze. On the base is set this inscription, which records these achievements:

1770 David Thompson 1857
Geographer and Astronomer
Passed here in 1797 and 1798 on a Scientific and Trading Expedition. He made the First Map of the Country which is now North Dakota, and Achieved many Noteworthy Discoveries in the Northwest.

It is a monument to a young lad from England, who went out at the age of 14 as an apprentice to the Hudson Bay Company. To a degree difficult for us to realize today, this lad roughed it in the fur trade, learning all he could about it while he was studying surveying. The greater part of his knowledge of surveying and the use of astronomical instruments he gained from an unambitious cartographer sent out by the Company. Unappreciated by the Hudson Bay Company, which, in this instance, seems not to have known when it had a valuable and highly talented man, Thompson quit and joined the great northwest in 1797. It was in that year the 49th parallel had been definitely agreed on as the boundary between Canada and the United States, and David Thompson at once went out to locate it. His exploits now stand commemorated in enduring stone, —another chapter in the history of the northwest.

Detaching the Twin Basalt Columns from a Cliff Near Wishram, Wash.



Preparing to Load the Twin Basalt Columns Onto the Flat Car

THE HOME OF THE GREEK REVIVALIST

ITHIEL TOWN AT NEW HAVEN, CONNECTICUT

BY
THOMAS E. O'DONNELL

THE home that an architect designs and builds for himself generally commands more than usual attention. Because of the qualities and training an architect possesses,—or is supposed to possess,—we expect to see displayed in the design of his own home the real personal ideals of the man couched in the terms which he considers the proper expression of a man of taste. The architect who has made real progress has, as a rule, arrived at the place where he has a definite architectural philosophy, and he puts something of his own personality into his work. This personal vein may be apparent through the fact that he works in some purely personal style, or in some historic style through the variations and adaptations in which he finds it easiest to express himself. To the architect this becomes a real and serious matter, but to those about him this personal style is likely to appear as his hobby. It depends upon point of view.

It is now generally supposed that during the Greek Revival period in America,—that period between 1800 and 1850 when the popular architectural style was a revival of Greek forms carried out to the letter according to exact proportions and measurements,—all Greek Revival architects and builders were cold copyists and that they had but one ultimate ideal,—the Greek temple,—which it was their aim to adapt to all purposes. From this it has often been inferred that the supreme delight of a Greek Revivalist would be to live in a replica of a Greek temple of superb proportions and beauty, regardless of its utility as a private house. But we are not sure that such was the case. Little or nothing is known of the houses in which the Greek Revivalists, Latrobe, Strickland, Mills, Davis, Thompson, or Rogers, lived. However,

House in the Greek Revival Style Built at New Haven about 1835
From an Old Wood Cut Published in 1839

we are fortunate in having an old print, published in 1839, of the house which Ithiel Town built for his own home, in New Haven, a cut of which accompanies this article. This seems to clearly indicate that this Revivalist, at least, was not content to live in an adapted temple type but that instead built his house in the refined spirit of Greek work and not in a copied Greek form, and also that he was able to write into a stiff, formal style something of the domestic quality that is expected in a place of residence.

Ithiel Town began his architectural career, it seems, in the Connecticut Valley; at least it is recorded that he moved, in 1810, from Hartford to New Haven and was the first architect to reside there. What his architectural training and experience had been previous to this, we have no record. Whatever his training or ability, it was evidently sufficient to justify the people of his community in employing him as an architect for a number of prominent houses and churches there. Later he was the architect for the old state house, built about 1829, in Hartford, which is of a Greek temple type. In this same year we find his name appearing as one of the members of the firm, "Davis, Town & Thompson," with offices in the then new Merchants' Exchange building in New York. Whatever his connection with this very early and very prominent firm of architects, it seems that he still carried on work under his own name, for he alone is credited as being the architect for the old Indiana state house, at Indianapolis, which was under construction in 1834. During this same period, 1833 and 1834, he was also the architect of the North Carolina state house.

It seems evident that Town's practice carried him into widely separated fields, but his exact relationship to the New York firm and his place of residence are not so clear. Although he maintained some connection in New York with either Davis or Thompson, or both, from 1829 to 1844, it seems that he must have retained New Haven as his home, for as late as 1844 the New York Business Directory shows him to be associated with A. J. Davis with offices at "93 Merchants' Exchange," while we now know that he had built his Greek Revival home in New Haven in 1839, and that it is also recorded that he died in New Haven in 1844. From the few facts obtainable, it is evident that Ithiel Town's practice greatly resembled the modern architect's in the far separated location of work. Town must have been an architect of unusual ability to have been known from New Haven to Indianapolis. The primitive and slow methods of communication undoubtedly made the practice of architecture in those early times even more difficult and more trying than it is today.

PUBLIC LIBRARY

Thaddeus Burr House, Fairfield, Conn., 1790. An Early Example of the Greek Revival

SMALL BUILDINGS

RECENT SMALL SHOPS

BY

KENNETH KINGSLEY STOWELL

THE measure of value in the architecture of small shops and stores is attractiveness. By this it is judged by the public, and attractiveness is interpreted in terms of dollars and cents by merchants. The latter, above all, are most directly concerned with the attribute of attractiveness which the architects can give to the premises; they must be able to attract people to their stores. Although the retailer may not be conscious of it, he probably carries in his mind an obsolete definition of the verb "attract," which Webster gives first, as "to draw or drawn in, as by suction." That does express his wish. He surely would use the word in the sense "to draw by influence of a moral or emotional kind; to engage or fix, as the mind, attention and so forth; to invite, to lure, as to attract admirers." Without such attractiveness his business cannot hope to prosper. There is ample evidence to support this, and such evidence may be seen on all our city streets from Maine to California and from Florida to Oregon. Certainly the illustrations reproduced herewith will bear this out.

Attractiveness in retail stores is not confined to any time or place or to any period or style. There has been a recent renaissance of good design in buildings of this character throughout the United States. One of the chief features, perhaps, in this development has been the successful effort to design buildings which are appropriate to the purposes of the stores and which, in some way, reflect the character of the merchandise for sale therein. All styles and all periods of architecture have contributed their share to the inspiration of the architects of the present. We find the greatest latitude in the use of precedent, as architects are not fettered with tradition but use it freely and with imagination to pro-

Photos. Tebbs & Knell, Inc.

Tutwiler Stores, Birmingham, Ala.

Warren, Knight & Davis, Architects

DETAIL, TUTWILER STORES, BIRMINGHAM, ALA.
WARREN, KNIGHT & DAVIS ARCHITECTS

Photos. Paul J. Weber

RECENT SHOP FRONT AT 9 EAST 56TH STREET, NEW YORK

GREVILLE RICKARD, ARCHITECT

SHOP FRONT AT 23 WEST 51ST STREET, NEW YORK
FRANK A. GOODWILLIE, ARCHITECT

Photos. George H. Van Anda

THE JOHN WARD SHOE SHOP, FIFTH AVENUE, NEW YORK

RICHARD H. SMYTHE, ARCHITECT

HOUSTON PUBLIC LIBRARY

INTERIOR OF THE JOHN WARD SHOE SHOP, FIFTH AVENUE, NEW YORK
RICHARD H. SMYTHE, ARCHITECT

PERFUME SHOP IN THE MODERN FRENCH STYLE, FIFTH AVENUE, NEW YORK
JOHN FREDERICK CONAN, ARCHITECT

Front of the Interior of the Delettrez Shop

Rear of the Delettrez Shop, Fifth Avenue, New York

duce the desired result,—attractiveness. In order to attract, it is felt that a shop must be different from its neighbors; it must be easily distinguishable from the others around it. This accounts for the great diversity in style and material to be found in the shop fronts on every street. Fifth Avenue is lined with shops, each differing from the others, each striving to appeal to those who pass and to attract them not only to their windows but inside. Every town or city has its Fifth Avenue, be it called Michigan Boulevard or Main Street, where small shops vie with one another to lure the prospective purchaser.

The attractiveness of the exterior is carried consistently throughout the interior in the modern shop. The "false front" is no longer enough to attract and hold the buying public. The appointments of the interior must continue to enhance the attractive impression given by the shop's exterior. That architects have been able to accomplish results which not only satisfy their own æsthetic taste but which contribute a determining factor in successful merchandising, is evinced by the ever-growing number of architecturally designed shops and stores. The appeal to the æsthetic is being recognized more and more wherever merchandise is bought and sold. More articles are being sold on their design appeal than ever before, and it is important that they be given their proper setting. The show window should be designed primarily to be the proper setting for the articles for sale within. The best of window dressers cannot succeed in displaying his wares without the proper architectural enframement, which the architect alone can give. Another element in the attractiveness of the small store is the appropriateness of the design to the character of the business, and we find this element is seldom, if ever, lost sight of by the architect. There are several good examples of this among the illustrations chosen. Certain classes of shops demand a more or less formal style of architecture; others demand a more intimate setting and surroundings. We have chosen examples of both kinds from many places. They show shops designed for the sale of many different articles, from cosmetics to clothing, from rugs to music.

The first example is of a building which by its refinement of detail and carefully selected materials bespeaks the character of the shops which it houses. It is essentially a building for shops that might be termed by the trade "high class specialty shops." If such a shop had merely one great glass front, it would have far less character and be far less effective in attracting patrons. The chaste and dignified arches make enframements for the display of show windows that add immeasurably to the interest of the articles exhibited. The architecture is formal and dignified without being cold. This is largely due to excellence in proportions and to careful consideration given to the profiles and the mouldings. The slight

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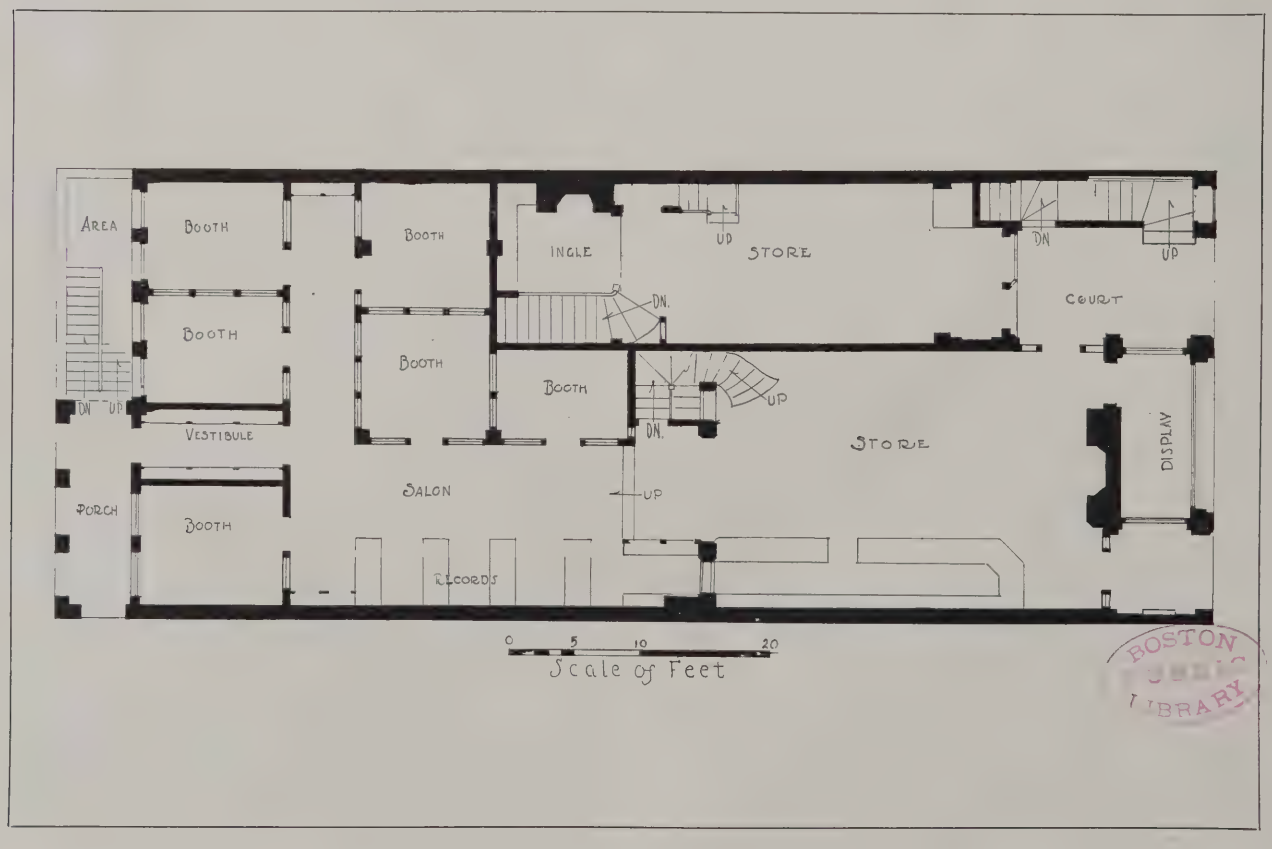
STREET FRONT OF MRS. FRANKLIN'S SHOP

SHOP FOR MRS. FRANKLIN, INC., PHILADELPHIA
TILDEN, REGISTER & PEPPER, ARCHITECTS

Photos. Trowbridge

MERCANTILE AND APARTMENT BUILDING, WINNETKA, ILL.
HAMILTON, FELLOWS & WILKINSON, ARCHITECTS



PLAN OF A SHOP IN THE CENTER OF THE BLOCK

Center Detail of the Mercantile and Apartment Building at Winnetka, Ill.

Corner Detail of the Mercantile and Apartment Building, at Winnetka, Ill.

projection of the keystone, which gives just enough relieving shadow, is especially noteworthy.

Many small shops have invaded residence streets and have called for alterations in older buildings. An interesting example of a successful alteration is shown in the illustration of the shop of Edouard Jonas, of Paris. The material chosen for the shop front is the same as that of the rest of the building, and the shop window has been placed in the center of the facade, recalling the large windows in the older portion of the building above. The railing above the cornice breaks what might be too sharp a line of demarkation, and forms a pleasing transition from the new to the old. The use of two symmetrical doorways might be criticized as confusing to a possible purchaser, since one door probably leads to the store and the other to the floors above.

An excellent example of the appropriateness of architectural treatment and ornamentation to the character of the store is shown in the imaginative little building for Tupper & Reed, of California. The trumpeter on the chimney seems to announce that music is the commodity on sale. A harp adorns the chimney farther down, and one almost expects birds to be singing in the little dovecote at the point of the roof. The plaque from Della Robbia's "Singing Boys" heightens this musical character. It will be noted in one of the smaller details illustrated, that even the name of the little restaurant, "The Piper," has been chosen to harmonize with the setting. In striking contrast are the unattractive stores at either side. Although this may seem to be carrying appropriateness to the *n*th degree, one must acknowledge the gain in attractiveness.

There are other examples of the more intimate types of small shops,—one a restaurant, "The Cloisters"; another a smart clothing shop in Philadelphia. In both of these shops the design is based on English precedent, and the results are achieved by the simplest means. Both use comparatively small panes of glass in the windows, divided by muntins that give scale to what otherwise might be an "aching void." Too often large sheets of plain, clear glass give such an effect. One can easily visualize the entire lack of character and the irreparable loss in attractiveness that would result if the present windows were replaced with single large sheets of glass. All distinction and all "scale" would be lost. The same would be true in the case of the shop of Henry V. Weil. In the latter, of course, the muntins are a practical as well as an æsthetic consideration, because a single curved sheet of glass would probably have had to be made to order at considerable expense, and would be difficult to replace.

The difficulties just mentioned are not deterrents where the use of curved glass is absolutely necessary in obtaining the desired effect. Modernist designers will make their materials fit their needs. One of the most recent examples is the Ward shop on Fifth Avenue, New York. Here glass is used in a multi-

Photos. Ford E. Samuel

TUPPER & REED MUSIC STORE, OAKLAND, CAL.
W. R. YELLAND, ARCHITECT

INTERIOR OF THE TUPPER & REED MUSIC STORE

STAIRWAY TO THE UPPER RESTAURANT

ENTRANCE DOOR IN SIDE COURTYARD

Photos. Drix Duryea

INTERIOR OF WHITTALL'S RUG SHOP, NEW YORK
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

ALCOVE IN WHITTALL'S RUG SHOP

ANTIQUES USED TO SET OFF RARE OLD RUGS

RUGS DISPLAYED IN AN ARTISTIC SETTING

tude of interesting forms. The central case is cylindrical, so that one may view the display from all sides. The semi-circular dome above is of gold and silver mosaic glass, and there is a brilliant background of silvered glass mosaic that makes a myriad-faced mirror of all the surfaces behind the central horizontal band of the design. Even the "drapes" suspended from this band are strips of glass of an interesting texture. The medallions are of cut sheet bronze and show a shoe-fitting scene. The interior is supplied with individual chairs designed along modern lines, and the sweep of the chair arms is in keeping with the roundness of the exterior design. On the walls of the customers' portion of the shop are some most interesting bizarre decorations in flat tones, very modern and exceedingly clever. Certainly such decorations are more attractive than the usual tiers of monotonous shoe boxes.

The shop of Delettrez is an admirable example of modern French design. It is characteristic of the distinctive shops found along the Rue de la Paix. Dark veined marble is one of the favored materials for such shops, embellished with bronze, silver and gilt bas-reliefs. The restrained richness and the refinement of these designs are intended to suggest superior wares and undoubtedly are assets of no mean value to the shopkeepers. The small scale of the show windows adds to the effectiveness of the display of the exotic little jars and bottles.

The interior of the shop which is known as "Whittall's Salon" is admirably designed to set forth the beauty of the rugs. The rugs demand accessories such as furniture and lamps to give an idea of their proper setting, approximating their proper use in the home. They have been admirably chosen. The textured walls make a fitting background for the soft richness of the rugs hung against them, and the tile floors are in pleasing contrast with the fabrics that cover them. Here again we find the architecture in scale with the product for sale. The larger rooms provide the proper settings for the rugs of ample sizes, and a most pleasing paneled alcove shows the use of the smaller rugs to advantage.

Very often an architect is called upon to design a building containing a row of stores that will be rented. Naturally in this case his problem is to design the shop fronts so that they will be attractive yet adaptable to the display of various kinds of merchandise. A successful solution of this problem is shown in the illustrations of the group at Winnetka.

Photo. Paul J. Weber

Georgian Precedent Used for Modern Shop Front

INTERIOR ARCHITECTURE

DETAILS FROM THE FRENCH CHATEAUX

MEASURED AND DRAWN BY
ALBERT A. CHADWICK
TEXT BY
PARKER MORSE HOOPER

THE unusual interest shown in the series of measured details from some of the lesser known French city houses by C. Hamilton Preston prompted THE ARCHITECTURAL FORUM to commission Albert A. Chadwick to procure and prepare for it a similar series of measured details from the French chateaux. Although the beautiful examples of Francis I and Henry IV architecture in Touraine have been constantly photographed and frequently described, there seems to be no English publication presenting illustrations and measured details of some of the more important examples of these interesting and fascinating examples of French architecture. It is hoped that architects in this country will find this series of chateau details not only of interest and inspiration but also of service for adaptation in their free expression of modern architecture, which use is splendidly illustrated in the ornamentation of the New York Life Insurance Building, by Cass Gilbert.

Because architectural design all over the world is undergoing a great change and because a new and freer expression, more individual and more original than has been known in several centuries, characterizes modern work in all the arts, there is no reason why precedent should be completely abandoned. By far the best and most conservative and satisfying examples of modern architectural design in Europe today are those in which architectural precedent is at least suggested, if not actually and accurately followed, in the architectural forms and details. Such buildings as the Town Hall and the Concert Auditorium at Stockholm are excellent examples of this new and freer use of the architectural styles of the past. In the Town Hall there is distinct evidence of the influence of Byzantine and Romanesque architecture. In the Concert Auditorium a new and original use of Greek architectural forms is evidenced. In the best of recent architectural design in this country a suggestion of one or another of the periods of the past is seen at least in the architectural ornamentation. Greek, Assyrian, Phœnician and Egyptian ornament and devices are used in new arrangements and fresh forms.

To the appreciative and conscientious student of architectural history the fact is undeniable that each new period of architectural development is a natural outgrowth from the period preceding. In character each period may be quite different from its predecessor, but certain characteristics follow through, though they may appear in a somewhat changed form.

Chimneypiece, Chateau de Blois, Francis I. Period

Chimneypiece, Chateau de Blois, Francis I. Period

DOORWAY, CHATEAU DE BLOIS

CHIMNEYPIECE, HOTEL DE LA BOULE D'OR

DOORWAY, SALLE DES GARDES, CHATEAU DE BLOIS

DOORWAY, CHAMBRE DES GARDES, CHATEAU DE BLOIS

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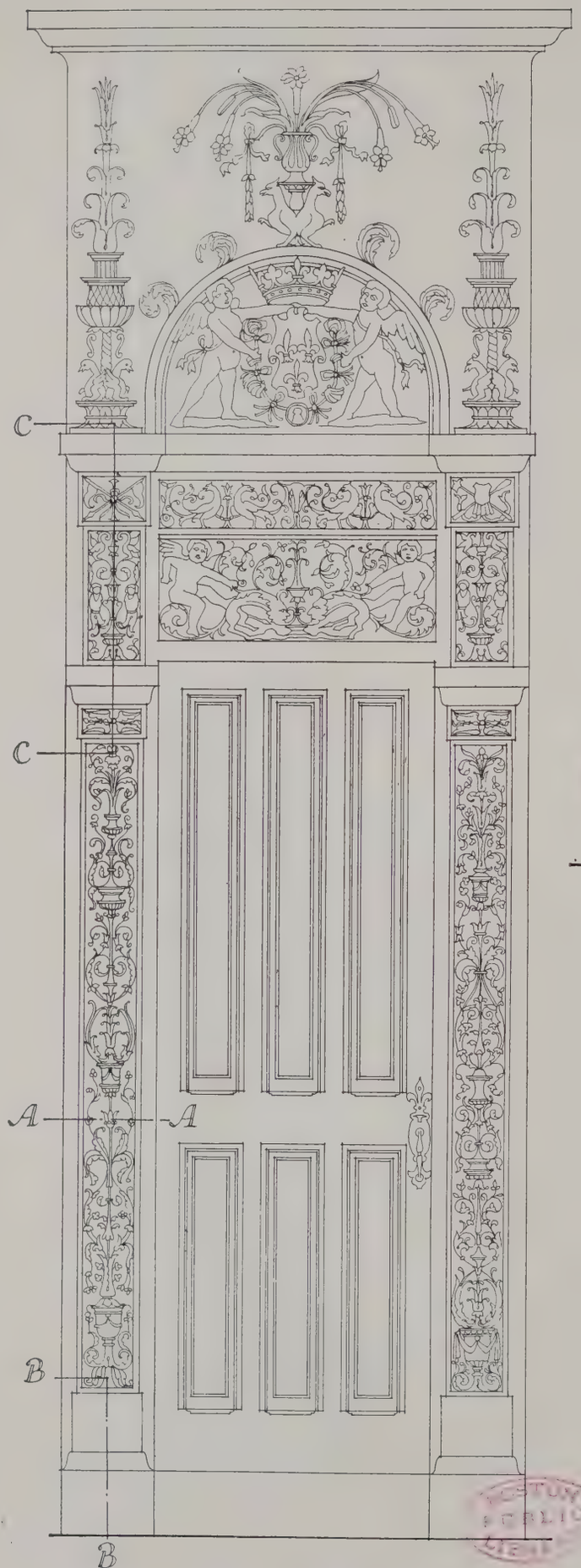
Chimney Piece in the Hotel de la Boule D'or Tours

XVI Century Period of Francis I.

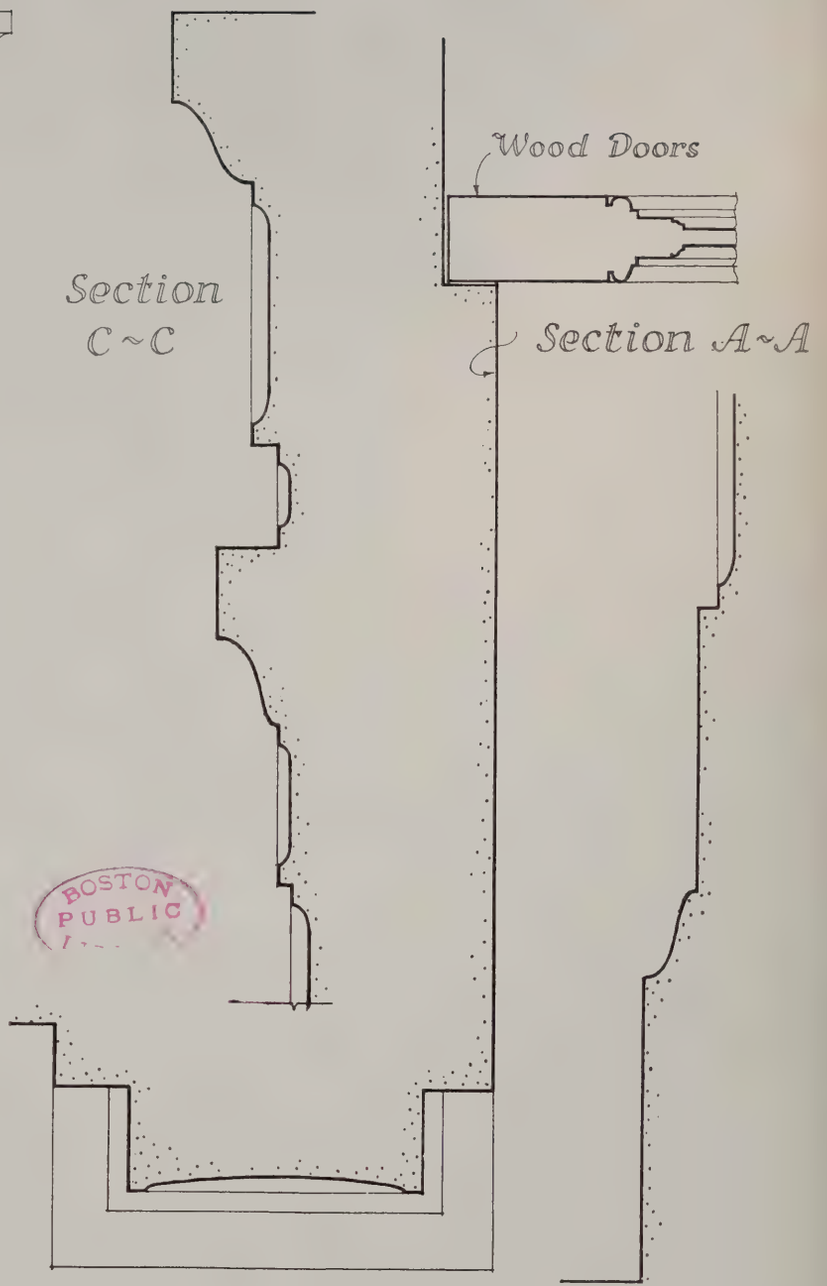
This chimney was built in the period of Francis I. (probably about 1525) It was designed by the Architect who designed the Chateau of Chenonceaux. The statue is Anne of Britainy . . . .

1 0 1 2 3 4

Graphic Scale



Elevation



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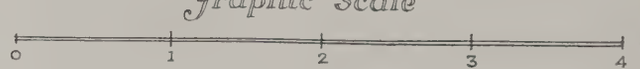
Doorway in the Salle de Gardes of Catherine de Medicis at the Chateau at Blois

Period of Francis I

Graphic Scale



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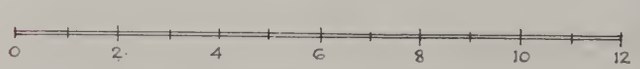
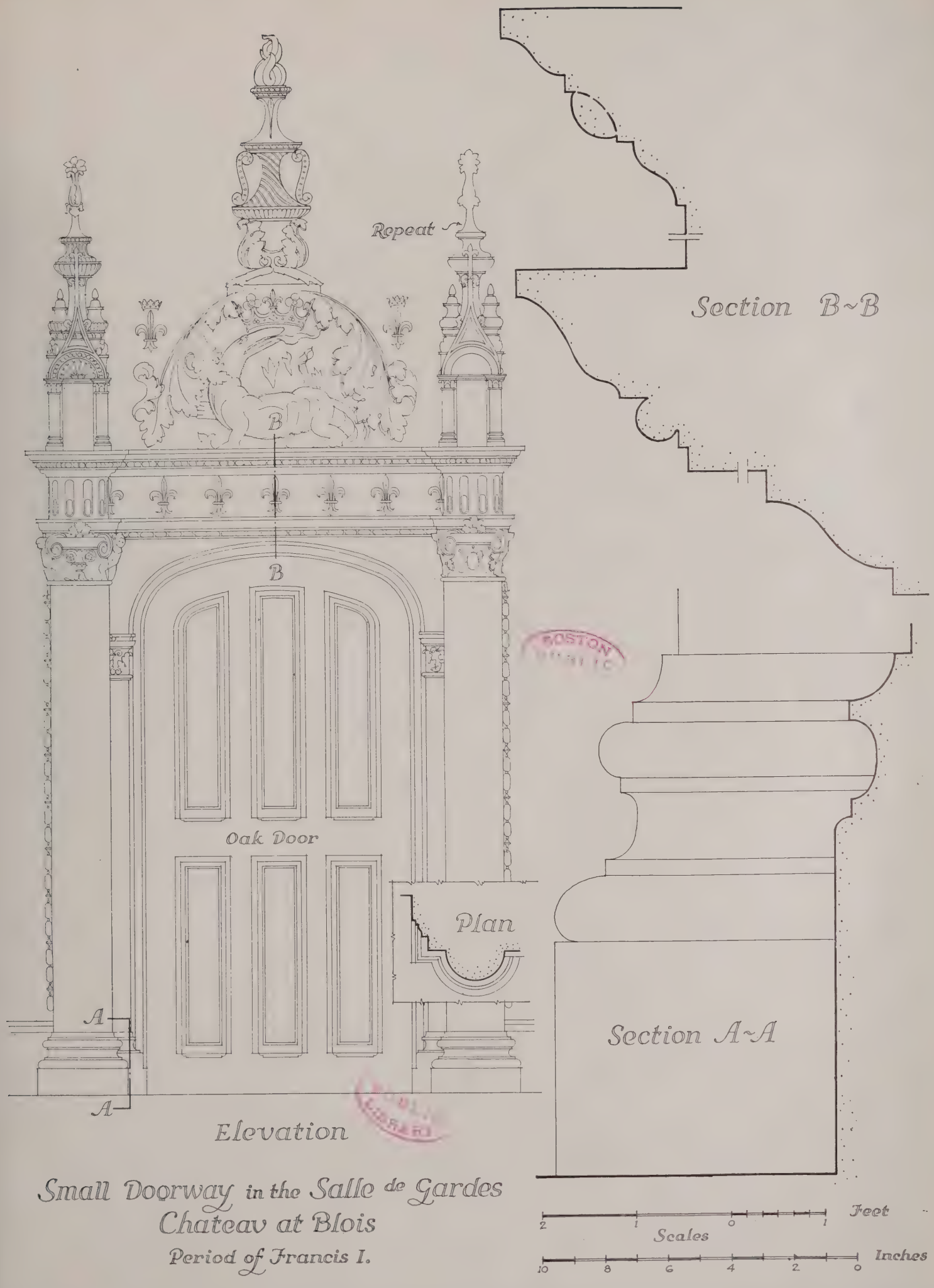
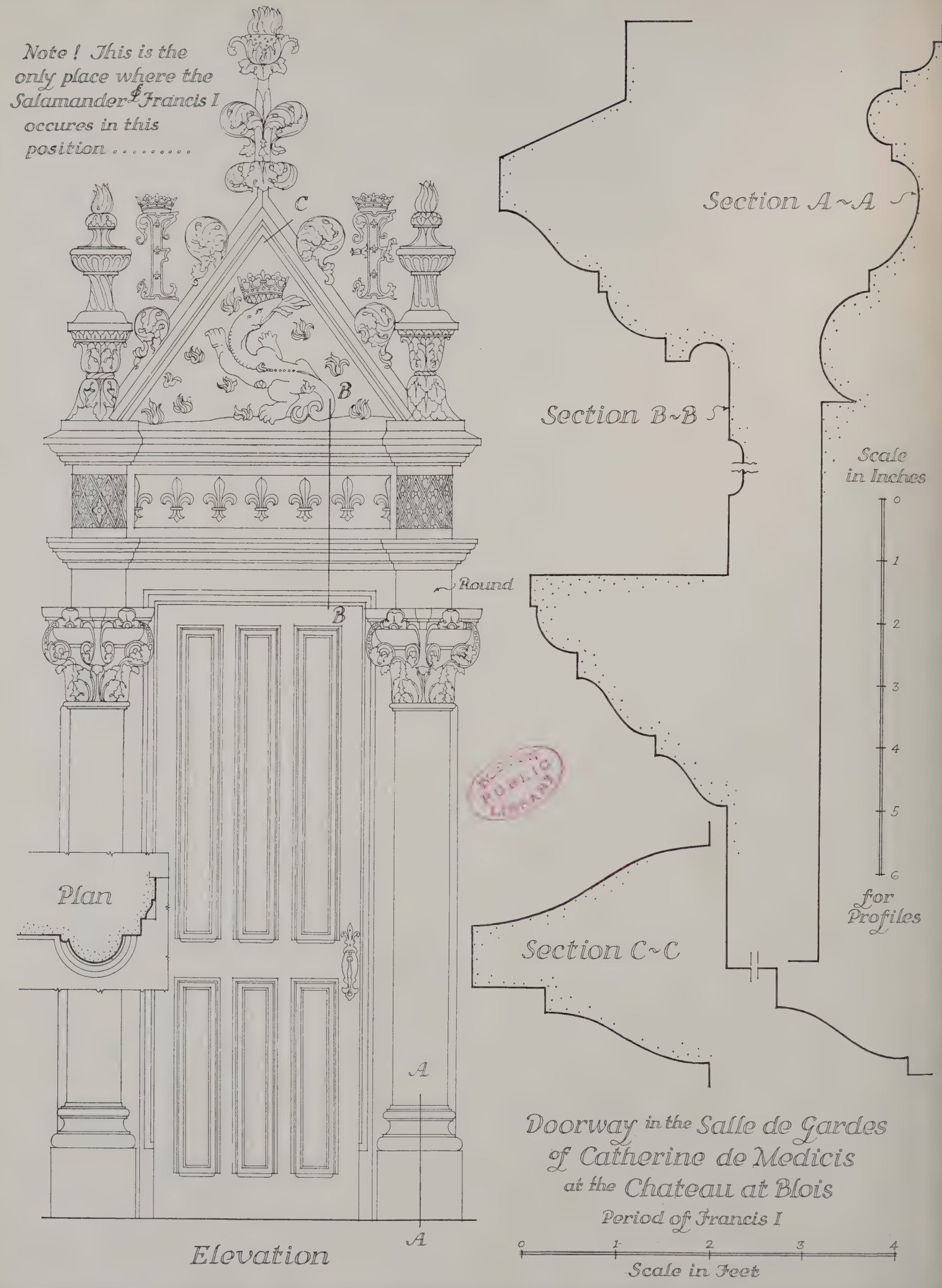


For Profiles



Small Doorway in the Salle de Gardes Chateav at Blois

Period of Francis I.


Note ! This is the only place where the Salamander of Francis I occures in this position .....
C
B
B
Round
A
A
Plan
Elevation
Section A~A
Section B~B
Section C~C
Scale in Inches
0
1
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for Profiles
Doorway in the Salle de Gardes of Catherine de Medicis at the Chateau at Blois
Period of Francis I
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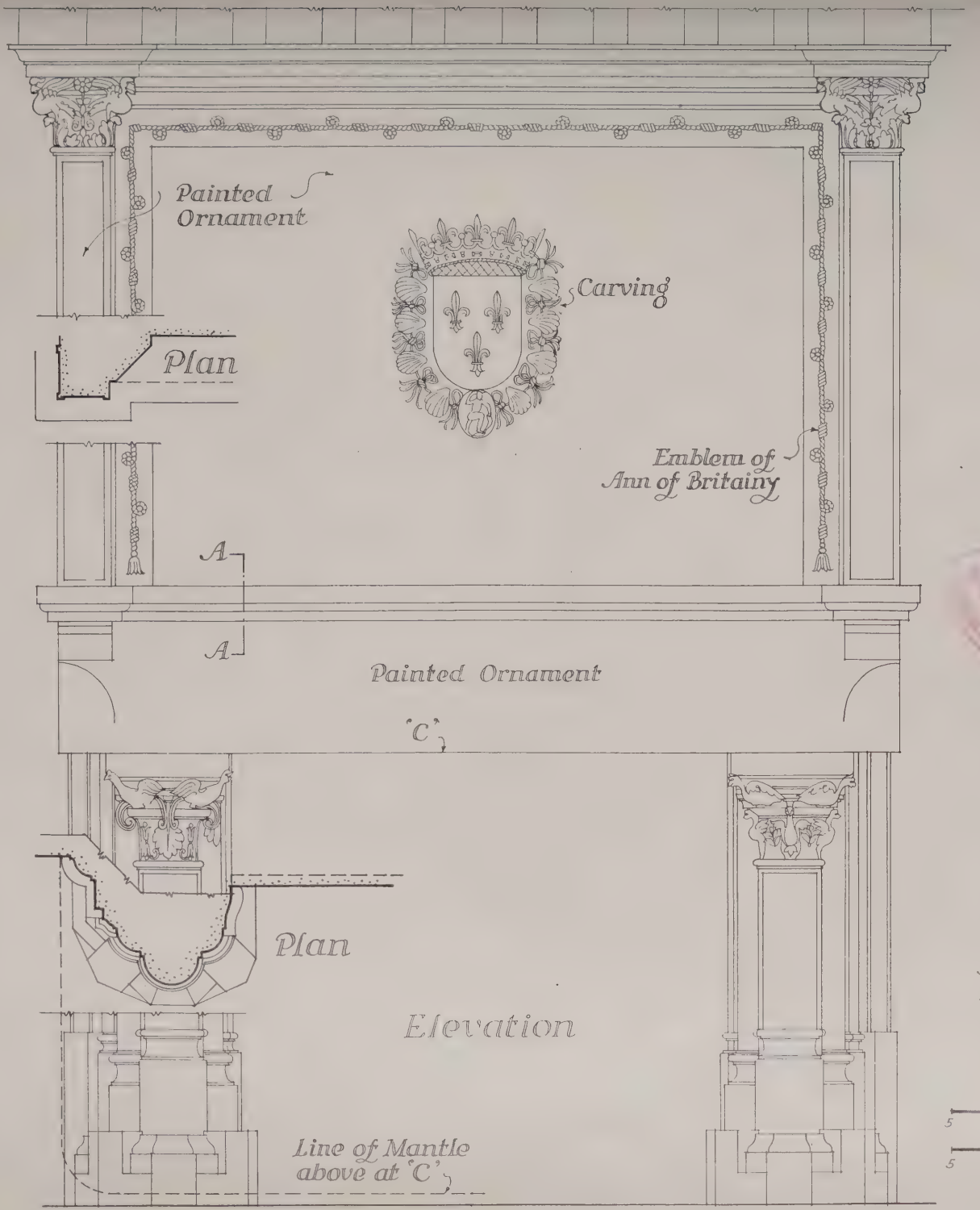
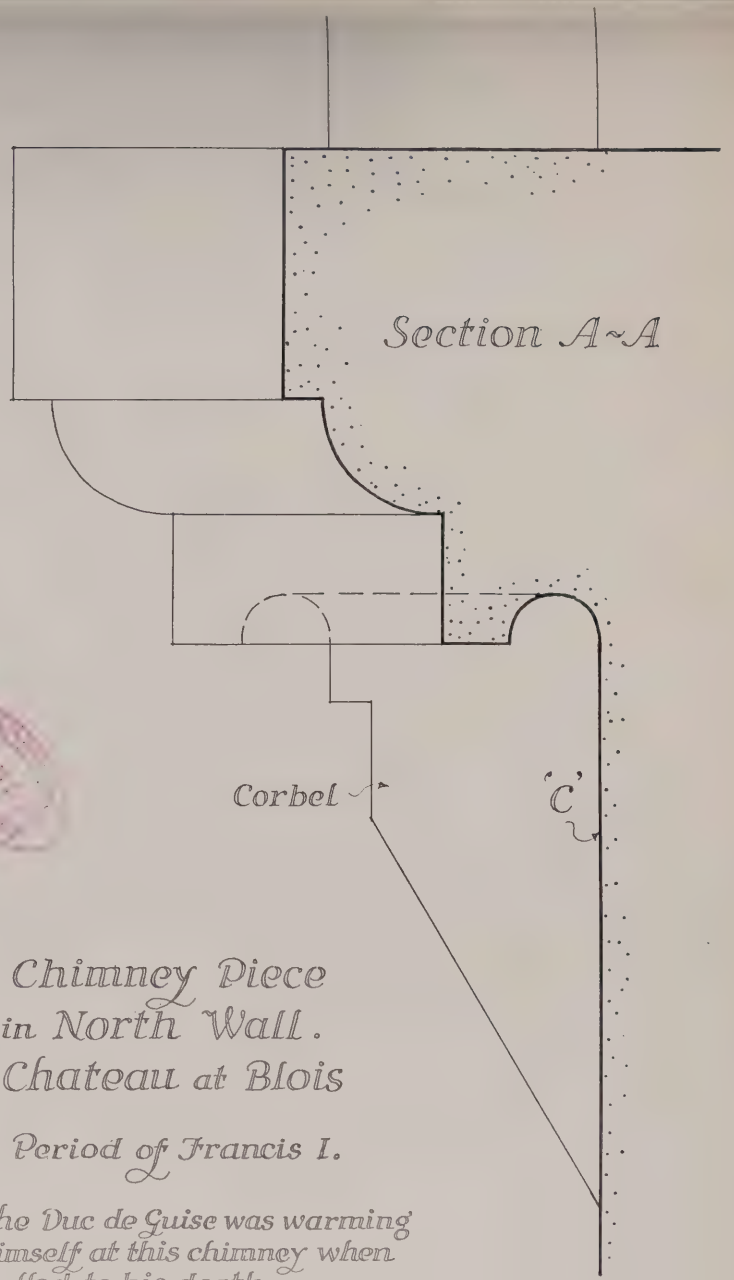
Scale in Feet



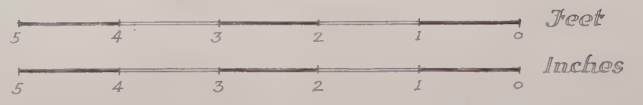


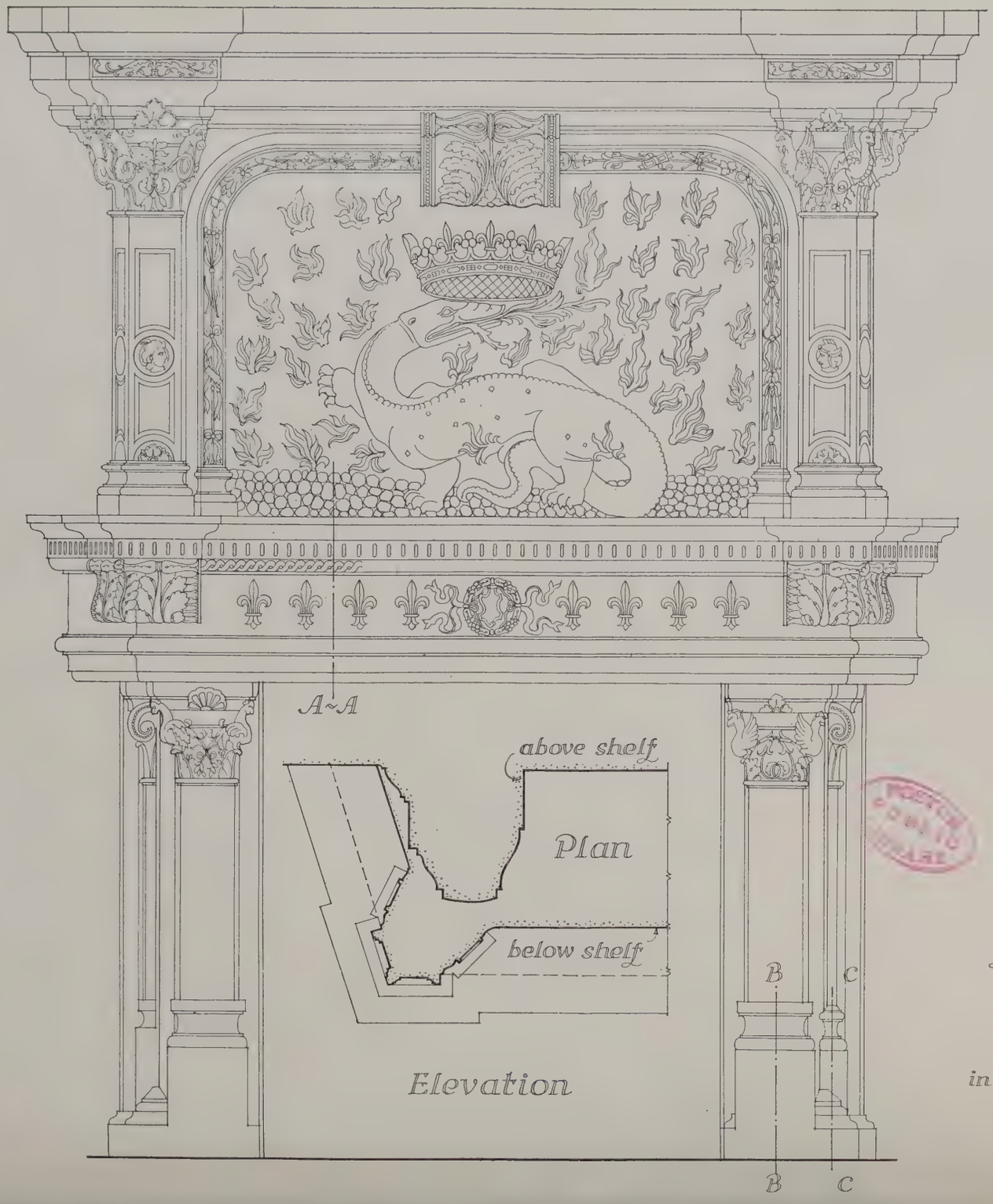
Chimney Piece in North Wall. Chateau at Blois

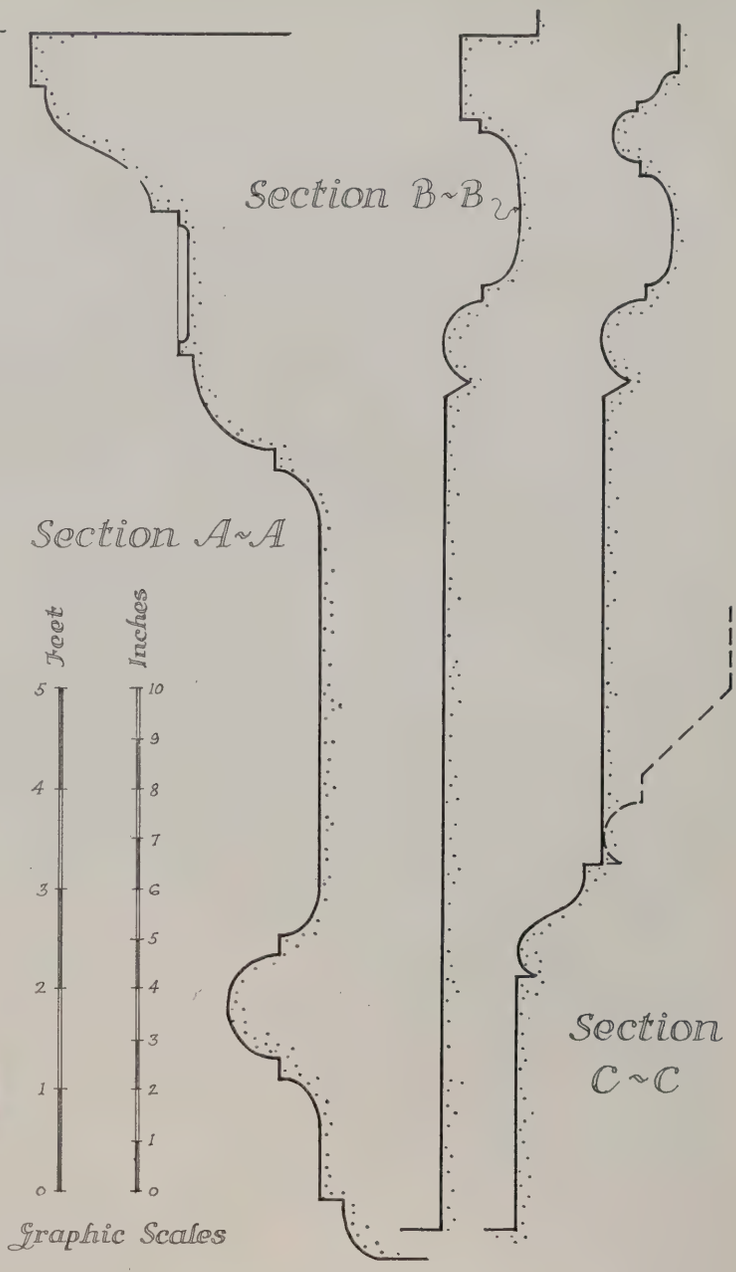
Period of Francis I.

The Duc de Guise was warming himself at this chimney when called to his death .....

Graphic Scales







Chimney Piece
in the Salle de Gardes of Henry III
Chateau at Blois
Period of Francis I.

F. a.

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BOOK DEPARTMENT

A VALUABLE WORK ON USE OF STEEL

Reviewed by FRANK W. SKINNER, CONSULTING ENGINEER

STRUCTURAL steel is the essential element of modern construction. In order to maintain and improve its function, the American Institute of Steel Construction, Inc., was organized in 1921. This organization is composed of steel constructors of the United States and Canada who represent practically the entire responsible industry, exclusive of that controlled by the operators of the rolling mills. It is the purpose of the American Institute of Steel Construction, in coöperation with the United States Department of Commerce, to improve the methods of designing, fabricating, and erecting structural steel; to eliminate waste in building construction; to reduce building costs by the use of its standard specifications for structural steel and for fireproofing the steel for buildings; and to make knowledge of structural steel in all its phases available for the benefit of the architectural and engineering professions. These beneficial and impartial objectives will be notably promoted by the use, among all designers and builders of framed structures, of this exceptionally complete and reliable handbook, that, within its specified limits, covers steel construction in the most practical and economical way, clearly presenting standards and principles of advanced practice coördinated with the best theoretical, mechanical and commercial considerations and the latest technical developments.

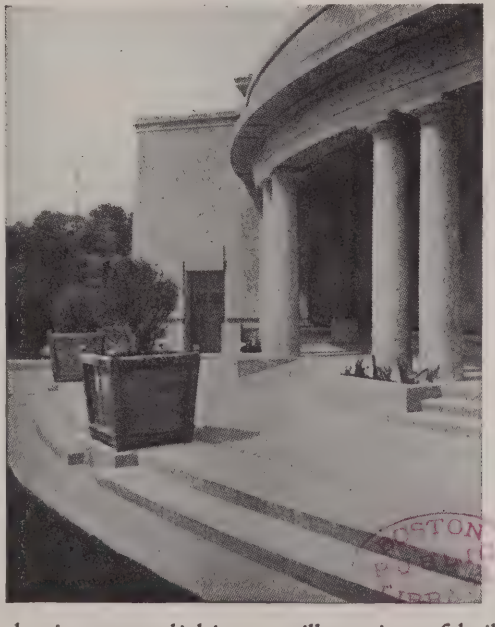
This book not only gives complete data regarding strength, properties, functions, standards and dimensions of the most important and indispensable of all construction elements but it gives exclusive useful tables of great mathematical and industrial value, together with the latest specifications and information not otherwise conveniently accessible to the designer and computer. It is unique in that it gives essential data of competitive products so as to facilitate impartial selections, and it is, withal, so simply and effectively presented and so conveniently arranged that it can well take the place of several other handbooks in common use and become a great saver of time and trouble to every designer. It is a sort of glorified commercial shape book, developed to a high degree of usefulness, impartiality and completeness on an extension of the familiar lines of the old rolling mill publications, whose essential features are supplemented by much fundamental designing data of the highest value covering ordinary requirements for selection, proportioning, detailing, fabricating and construction in a remarkably clear and simple manner that presents reliable convenient working formulæ and tables purged of all complexities and applicable with a minimum of arithmetic and algebra, which of course means saving of time.

The volume includes the signed conclusions of eleven

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. "Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use."



THE text of this work dwells in detail upon the working of concrete; details of construction; continuous vertical support; verticality; monolithic concrete; concrete vaulting; textures; "crazing"; and treatments; and other subjects of importance to the architect, engineer or builder concerned with concrete. It sums up and presents the experience of many successful workers in concrete construction. The volume deals with concrete and with its design as influenced or governed by its construction. Its authors have been fortunate in selecting admirable examples of the use of the material, and the work contains, among a large number of illustrations, views of residences, tall structures such as hotels, theaters, power houses, or office buildings; bridges, aqueducts, retaining walls and walls of other kinds. The views are of work in more than one country, for there are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States

Text and 100 Plates; 8½ x 11 ins. Price $10

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eminent steel engineers and builders with a large amount of classified and tabulated data most convenient for rapid and effective use. In the first part are standard specifications for the manufacture, properties, inspection, testing, stresses, and fabrication of structural steel for buildings, and a complete fireproofing specification defining fire temperatures and hazards and the materials and application of insulation. The maximum live loads and various allowances permissible for different parts of a building are given, and there is a concise history of the development of steel and iron with valuable data concerning their physical properties that are of importance to every designer. The accompanying code of standard practice is intended to eliminate those errors, misunderstandings, losses and delays that so often occur in the relations between engineers, architects, builders, contractors, dealers and owners; it makes fair definitions and provisions governing most cases subject to misunderstanding or variation, such as requirements for plans, specifications, bids, and contracts, classification of materials and members, workmanship and standard practices, inspection, delivery, delays and extra work.

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STEEL CONSTRUCTION; First Edition, Second Printing, March, 1928. 391 pp., 5½x8 ins. Price $1.50, American Institute of Steel Construction, Inc. 285 Madison Avenue, New York.

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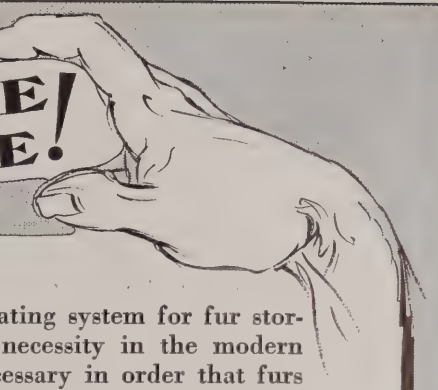

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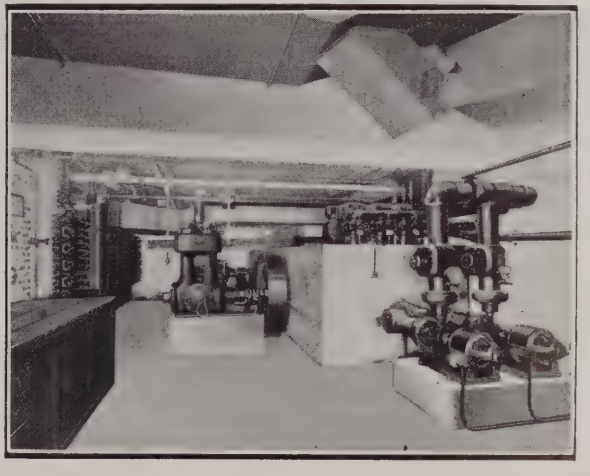

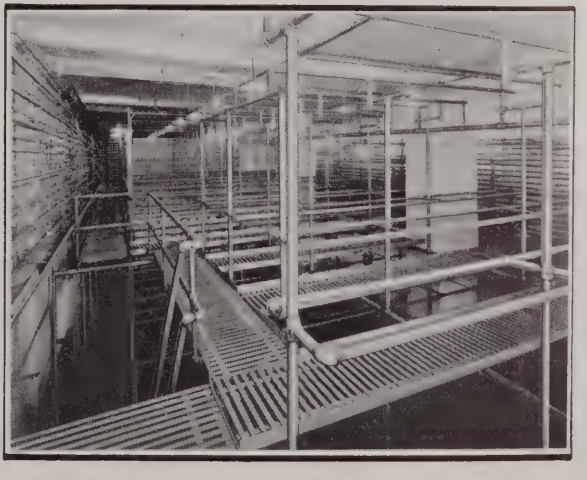

The above shows Russek's Fifth Avenue store in New York City. To the right will be seen the York refrigerating equipment provided to maintain a controlled and guaranteed temperature in the fur storage. The lower right picture shows the fur vault with racks and garment hangers, as well as the mezzanine—in this vault is maintained, at all times, the required low temperature by York apparatus for the furs, fine garments and fabrics stored therein.

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FORTY YEARS OF LANDSCAPE ARCHITECTURE. Frederick Law Olmsted, Sr. Edited by Frederick Law Olmsted, Jr. and Theodora Kimball. 575 pp., 5½ x 8½ ins. Illustrated. Price $7.50. G. P. Putnam's Sons, New York.

THE prolonged effort by certain groups of citizens to save Central Park from the state of neglect and deterioration into which it has fallen, and the present activities of the city to restore the park, give a certain timely interest to the second volume of "Forty Years of Landscape Architecture." The Sage Foundation—Regional Plan Committee in making a contribution toward the cost of this publication, recognize its value as a statement of the original policies and ideals in matters pertaining to the design and administration of Central Park. It is a careful piece of research into the choice of site and design, and of the mere location of the park in its relation to the rectangular street plan.

Early discussions of possibilities are fully related, as are the details of construction and management and the political history during the period from 1850 to 1880, in which the firm of Olmsted & Vaux was officially connected with the work. Chapter XIII, written by F. L. Olmsted, Jr., constitutes an act of filial devotion expressed in a rationalistic defense of his father's theory as embodied in his first important work. It is, besides, an effort from the heart to erect bulwarks for the defense of the romantic, naturalesque style against the ever-increasing trend, plainly evident, toward classicism.

In publishing many of the written communications and reports of F. L. Olmsted, Sr. to the park commissioners, it has been the evident intent of the editors to select those which would emphasize the definite purpose of the designer and to illustrate his methods of control and management, upon which the successful accomplishment of his ideal so largely depended. His conception of the function of Central Park is thus expressed by his son: "The dominant and justifying purpose of Central Park was conceived to be that of permanently affording, in a densely populated central portion of an immense metropolis, a means to certain kinds of refreshment of the mind and nerves, which most city dwellers greatly need and which they are known to derive in large measure from the enjoyment of suitable scenery." What suitable scenery may be is clearly a matter of personal feeling, but it was the belief of the designers that the naturalesque landscape style as developed in England seemed to fulfill this definite purpose, and we see in it the prevailing romantic tendency which existed in all forms of art at that time. That these landscape qualities were attained with a high degree of effectiveness under difficult conditions is a remarkable achievement, and gives strong testimony to the devotion and ability of those who planned the park and are responsible for its design.

The history of the first 30 years of Central Park shows the necessity (if the original ideal is to be maintained) not only of adequate financial support but of a more or less autocratic control on the part of those responsible for its maintenance. To what degree the Olmsted theory of the character and function of Central Park can be maintained under present conditions depends upon the feeling of the patrons of the park, and F. L. Olmsted, Jr. has elsewhere expressed his belief

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that the park is out of harmony with its surroundings and cannot simulate rural scenery when skyscrapers are always in view. The demand by many people for children's playgrounds and the necessities of automobile traffic are indications of encroachment upon an area in the city which was designed for a purpose in its nature wholly incompatible with these things, and they are additional reasons for the present difficulty of fitting the rationalized conception to the facts. Wide thoroughfares and supervised neighborhood recreation grounds are recognized necessities, scantily provided in New York and sadly missed. As long as Manhattan suffers from these defects in its physical equipment, Central Park will continue to be in danger of injury, if not of actual destruction, which as a matter of fact has actually been begun in the Heckscher Playground. Judging from appearances, too many of the users of the park today are not appreciative of the qualities which are the essence of its character, and others resent the restrictions which are so necessary to preserve the rural type of scenery. Scenes soft and lovely of this kind are not suitable for congested populations or for intensive use.

One is led by Mr. Olmsted's argument to suppose that money and skill can restore the refreshing "verdurousness" of the original pastoral and romantic scenery, but the question arises, why do it if it means that the public must view this "verdurousness" through iron fences as if they were monkeys looking out from a cage, and if a large force of trained keepers must be on hand to prevent any use of attractive corners and wide meadows? When the preservation of the park is accomplished, what will be done to compensate New Yorkers for the loss of many of the much longed-for forms of recreation which the designers expected to provide, but which will be imposible in a perfectly preserved scene? Idle contemplation from the other side of a fence is no compensation to most people,—to those who frequent Central Park.

On the whole, the book has tended to strengthen the conviction in the mind of the reviewer that the perpetuation of the original plan is incompatible with present needs and political conditions. The automobile and skyscraper age has brought about changes which inevitably affect the plan and nature of a large recreation ground in a city, and this should be recognized by readjustments, without destruction of the entire scheme. There must be a critical point in the increasing use of a naturalesque park when the number of users is so great that the beauty of the naturalesque scene is destroyed by their very presence. For some the point is soon reached; for others it may never be reached, because they may prefer the crowd to the verdure. The refreshment of the spirit, whether one prefers crowds or verdure, may be the same, the choice depending entirely upon one's predilections for romantic dreaming or for hard-minded contemplation of things as they are and must be, but if a compromise can be made so that a large part of the naturalesque woods and meadow can be preserved and large additional facilities be provided for walking, for gatherings, and for the freer use in certain parts, both the soft- and the hard-minded may be partially satisfied. Lacking this reasonable compromise, it is safe to predict the destruction of the park by complete formalization.

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THE DELAWARE RIVER BRIDGE

PAUL PHILIPPE CRET, ARCHITECT

From a Preliminary Sketch by F. Walter Taylor

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER ONE

JULY 1928

THE ARCHITECT AS COLLABORATOR WITH THE ENGINEER

BY
PAUL PHILIPPE CRET

THERE lurks in humanity, whose curious role has always been that of the destined antagonist of nature, a persistent dissatisfaction with nature's inert obedience to its own laws; a dissatisfaction that is active and noble in certain aspects, and in others, foolish and blind,—the source of human power and of human weakness in equal parts. What, for instance, is this paradoxical attitude of mind which combines a clear perception of the laws of progress with a stubborn tendency to look backward, and to see in the past the ideal toward which society ought to be—and is not—proceeding?

Thomas Huxley once observed that Herbert Spencer's idea of a tragedy was a "Theory killed by a Fact." But Spencer was not advancing a mere theory when he defined evolution (that is to say, progress) as the development of the homogeneous into the heterogeneous. He was describing a fact which must, indeed, have been observed long and frequently before his own time for his statement of it to be accepted with such delight as a brand new Truth. In our enlightened day, the high school graduate can glibly inform us that the tendency of all natural organic development is from unity to multiplicity of function, from the homogeneous to the highly differentiated; the full grown man, contemplating our world, and comparing it, by the light of history, with the worlds of other civilizations, sees the law operating in every field of life and action. But it is a law of incessant change, eternally bringing to birth new conditions, eternally forcing him to new adjustments, new ideas, new problems; he is uncomfortable and uncertain, and oppressed at times with an impatient nostalgia for the familiar past. Yet nowhere does he see any example of nature contradicting itself, changing its mind midway, as it were, and remitting the pitiless pressure which forces him on to the future, and to experiences which he cannot foresee.

In this century, when human society finds itself feverishly conscious of its own extraordinary complexity, the idea of a reunion of the separated and highly differentiated parts of its own machinery becomes a dream in which restless and confused imaginations seem to find a fitful repose. A generation whose vast demands upon itself have split the old professions into multitudes of professions, and multiplies them daily with fresh needs for specialization, dreams of its superman who will unite in a supreme genius the knowledge that every day becomes more intricate and more detailed. And the dream becomes all the more cherished as the hope of its realization becomes more futile.

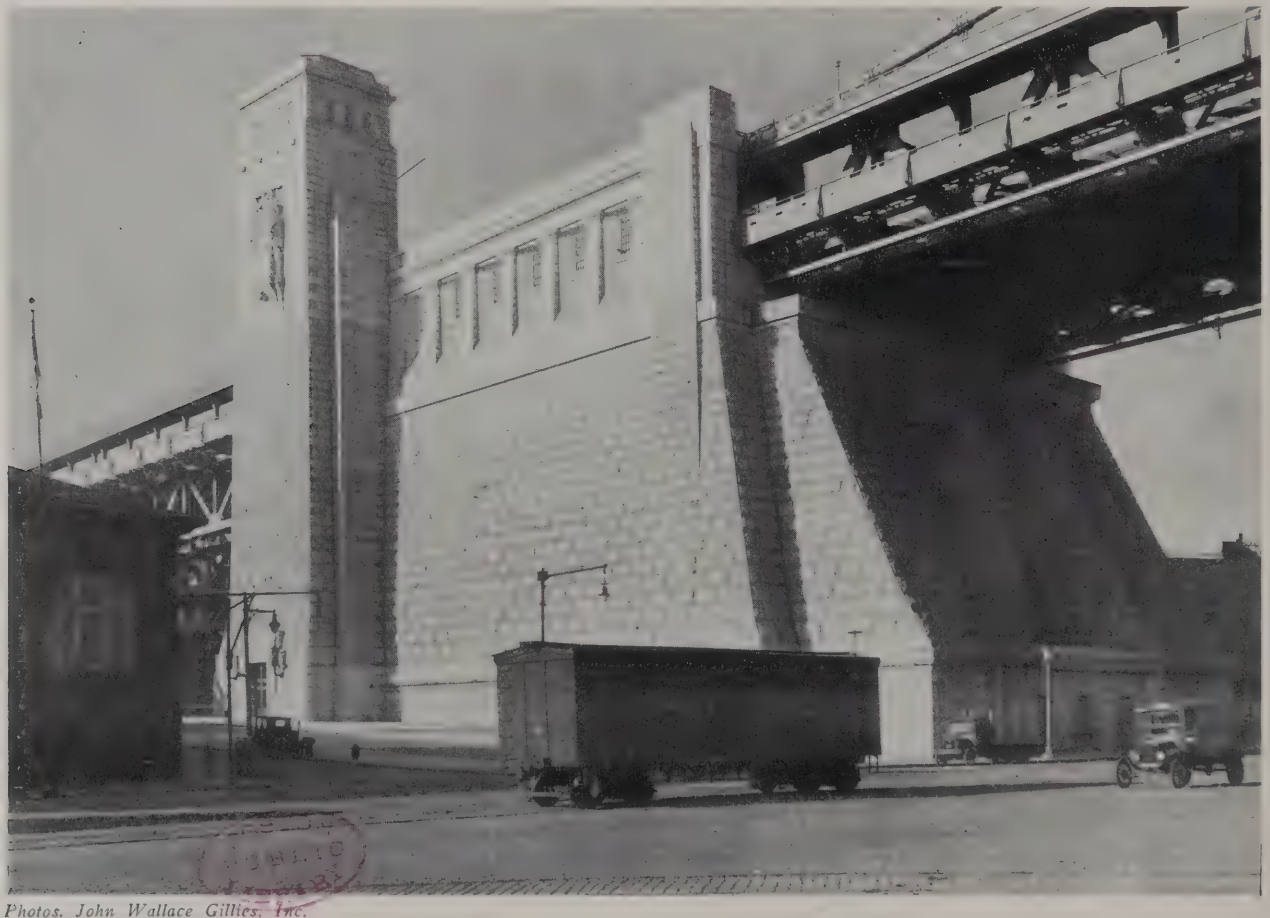
In the year 1747 the institution of the *Ecole des Ponts et Chaussees* in Paris signalized the definite division of the hitherto united professions of engineering and architecture into two distinct professions. Up to that time the engineer, as a specialist in building problems, did not exist. The great bridge builders, for instance, of the seventeenth and eighteenth centuries,—Ducerceau, the Mansarts, Gabriel, Gauthey, Pitrou, and Peronnet (who was the creator of the modern stone bridge),—were architects primarily, trained in architecture, which included what we would now call engineering as one of its branches. That they were masters in both fields is amply proved; the Chapel at Versailles, the *Ecole Militaire,* the Place de la Concorde testify to their ability as architects; the *Pont Neuf,* the *Pont Royal,* the bridge at Blois, and the bridges of Peronnet, which have served as models throughout Europe, to their skill as engineers. Occasionally they had their failures,—as is illustrated by a story at the expense of Jules Hardouin Mansart, which has furnished consolation and a certain ignoble pleasure to several generations of rising architects; the same Mansart, incidentally, whose collaboration with Frere François recalls the tradition of the *"freres pontifs,"*—the brotherhood of bridge builders of the middle ages. Mansart had built a bridge across the Loire. Some time later, when he was at the court of Louis XIV, an official from the district appeared at court for an interview with the king. At the end of the audience, Mansart, whose childish vanity or love of praise was a well known weakness, strutted up to the official and inquired:

"And how goes the bridge?" "Well," replied the other drily, "at the rate at which it was going when

The Delaware River Bridge from the Shore

I left, it is probably at Nantes by this time." Nevertheless, however we may relish a story that restores such men to the human scale, it is to these consummate masters of an ambidextrous profession that we look backward. Their bridges of stone, sturdy and beautiful, will outlast our bridges of steel, and their stately and ample building is not easily surpassed.

At the same time, it must be remembered that their problems were not our problems; nor could they have foreseen, even dimly, the conditions that have developed since their time. Within the last 60 or 75 years the development of steel as a factor of construction has given rise to the necessity for mathematical calculation so complicated and so highly specialized as to have become an individual profession in itself; and every branch of engineering has grown and been subdivided in turn, so that today it is not simply "the engineer" but the mechanical engineer, and the electrical engineer, and the structural engineer, etc., each a specialist in a profession as distinct from other professions of the same family as architecture is from engineering. For a single man to attempt to make himself master of the entire field of modern mechanical mathematics would be little short of lunacy. How, then, can the architect, faced every day with the growing complexity of his own work, hope to unite the necessary proficiency in mechanics with the necessary proficiency in his own province? The increasing diversity of taste in plan-



Photos. John Wallace Gillies, Inc.

Anchorage and Pylon, Delaware River Bridge

Paul Philippe Cret, Architect

ning and in the use of materials and the necessity of directing a large staff of minor artisans and tradesmen force him to forget even such mathematics as he has learned in order to devote himself exclusively to the problem of æsthetics.

No, it is futile to look backward. Not only has the unity of the old profession been severed, but with each day the hope of reuniting the separate departments of architecture and engineering becomes more vain. Nevertheless, the two professions remain complementary to each other,—individual, impenetrable each to each, yet indissolubly connected, for good or ill. Such is the situation that has given rise to a complaint that is widely made today.

It is argued that this "division of labor" and intense specialization in two professions that are basically interdependent, must entail a serious disadvantage: namely, an inevitable absence of unity,—the unity which is the *sine qua non* of æsthetic value,—in a construction which cannot be conceived as a whole, and worked out in every organic detail in the mind of a single creator. However convincing the argument may sound, the remedy of the evil is not likely to be found in the reappearance on a super-scale of the architect-engineer; but, on the other hand, the evil itself may not be as real as it seems. It is even possible that so far from being a menace to an æsthetic ideal, this division, which has given rise to a powerful new influence in modern

Preliminary Sketch of Anchorage, by F. Walter Taylor

General View of the Bridge from the Water Front

Paul Philippe Cret, Architect

The Base of a Pier

View from the Footwalk

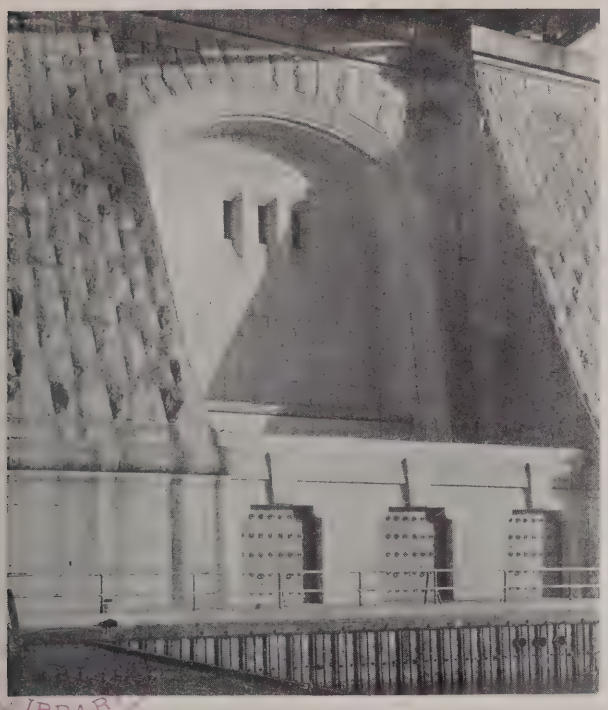
construction, may be the source of a renewed beauty, of an architecture more chaste and vigorous than we have known for many years.

In the full tide of the Victorian age,—that bewildering era when beauty, unhappily confounded with an idea of genteel falsehood, was believed to lie in the successful dissimulation of truth, when "polite" language was a tangle of ladylike euphemisms, and homely objects of utility were monstrously disguised to resemble anything under the sun but what they really were,—Taine remarked that strength and dignity of design were attained not by dissembling but by emphasizing structural purpose. The observation was less a forecast of a new ideal of beauty than a redefinition of a vital element of beauty, which has always been present in fine examples of architectural design. In recognizing the possibilities of beauty latent in the sheer mechanical frame of a construction, we have discovered nothing new. The "new" influence that has come from modern mechanics, from the creation around us of forms evolved by the effort to realize absolute utility and absolute economy, has simply aroused us to a fresh realization that "the laws of number are the laws of order and reason," and that beauty is as much the child of cold reason as of imagination. The Greeks knew this, and the Egyptians before the Greeks; the great architects of later times were those who had not forgotten it.

Le Corbusier says: "The Engineer, inspired by the law of economy, and guided by mathematical calculation, brings us into harmony with the laws of the Universe."

But in the enthusiasm which many of us feel for the austere and logical forms which are developed by mechanical mathematics, and in the reaction against the mawkish, the illogical, the senselessly elaborated and meaningless architecture that has been developed out of a feeble sentiment for the "quaint," and a timid respect for popular taste, we must guard against a tendency to make a fetish of the rigid forms that are produced by pure mechanics. *"Dum vitant stulti vitia, in contraria currunt,"*—foolish people, while they are avoiding one vice, rush upon its opposite.

In the cold, simple, and intensely practical forms that have been created to meet the clear-cut demands of utility, there are logic and clarity; in them we see the vigorous starkness of purpose fulfilled, to the exclusion of every other objective. But though we look upon them with a sense of intellectual satisfaction, it is without emotion. We recognize in the concrete expression of mechanical law, the presence of the self-same laws that control and direct universal forces. But though the imagination is stirred, it is not satisfied. Logic and clarity and strength, although they are elements of the beautiful, are not all there is to beauty. Until they are emphasized by subtle modifications of lines and structural proportions,—until a sense of harmony, of rhythm and accent fuses them into an æsthetic unit, they remain mute; they are seen, but they are not felt. To quote again what M. Louis Dimier has said: "The necessities of construction, even supplemented by what M. de Baudot calls economic and social necessities, will never suffice to build an edifice. For of course these ideas have only a limiting and corrective value; they are not creative and fruitful. What is fruitful is the conception of form; it is design which emanates neither from geometry



Base of the Anchorage

Section Drawing of the Bridge

nor from mechanics, but from the imitative arts."

In brief, the architect is not relieved of his task. Architecture remains an art, serving an intense and ineradicable human craving, which art alone can satisfy. Moreover, an anchitecture which is deduced solely from the necessities of construction is not architecture, because it is not art,—it fails completely to evoke the emotional values latent in a mere manifold of mechanical factors. "Architecture begins where the calculations end."

Thus we return to the æsthetic problem. The architect and the engineer must perform a sort of *duo,* each contributing his share of special knowledge in the creation of a structure which is to be both a mechanical unit and an æsthetic unit. To the engineer, the proof of the value of his work lies solely in its durability and precise fitness for a utilitarian purpose. Æsthetics are "not in his line." Yet it is he who gives the skeleton of the construction. Obviously, therefore, the architect is limited by mechanical conditions imposed upon him from the beginning. Nevertheless, he must control these limitations, and with them, rather than in spite of them, express an organic harmony of design between the mechanical and architectural factors of the structure. "The architect, by establishing a relationship of forms, realizes a pervading order which is the pure creation of his mind; by these forms, he affects our senses intensely, arousing the perception of plasticity; by the relationships which he creates, he awakens in us profound resonances, he gives us a sense of order which one feels to be in accord with the order of the universe, and which we perceive as beauty."

The entire mechanical unit must be intensely realized by the architect before he can endow it with character and significance,—animate it so that it speaks to the imagination and stirs the emotions. Then he may begin his labors, mindful of the truth that Taine has noted,—that strength and dignity of design are attained not by dissembling, but by emphasizing structural purpose. Furthermore, the mechanical restrictions themselves are not wholly inflexible, and the mechanical solution is not necessarily arrived at independently of all æsthetic consideration. The mathematician, working to reconcile a number of mechanical conditions, may find not one, but several solutions,—all equally adequate to meeting the requirements. Obviously there arises a question of choice which may be guided not by mechanical, but by æsthetic considerations. Again, details, such as the shape and thickness of certain beams, or the proportions between certain parts of the steel structure which have no bearing on the mechanical adequacy, can be determined according to their relation to the architectural problem. Details,—yes; because a fundamental change is not necessary to render a form *significant;* but the knowledge that must be drawn on, to effect these minor changes, so vital to the beauty of the whole, is gathered only after long training in æsthetics.

Thus, the architect, collaborating with the engineer, finds that even in the construction of the framework itself, he can exert an influence toward the architecural design that he is to develop. On the other hand, for him to ignore the influence of the mechanical design would be a fatal step in the direction of defeating the whole æsthetic purpose. He cannot allow himself to forget, for instance, that the "spirit" of a steel form is not the "spirit" of

Flag Pole Base and Lamps

Lighting Standard at Philadelphia Plaza

stone. In the middle of the last century Labrouste was among the first to realize the truth of this important canon of modern architecture, and to experiment in designs peculiarly adapted to the strength and simplicity of the steel frame. The "beauty of iron" is not the "beauty of marble" or granite. The cartouches and architectural mouldings of the stone vocabulary lose all meaning as the ornamentation of a metal form. The piers of a steel bridge are—the piers of a steel bridge; to conceive them as a "portal," and so to develop them architecturally as a Roman city gate, or triumphal arch, would be a fatal contradiction of their function. Always, the clear and at the same time imaginative interpreta-

Anchorage Pylon from a Side Street

Sketch of a Coat of Arms for Pylon

Delaware River Bridge, Details

Paul Philippe Cret, Architect

Main Pier, University Avenue Bridge
Paul Philippe Cret, Architect

Pylon Tower, Delaware River Bridge
Paul Philippe Cret, Architect

tion of structural function must be sought, as where the angle of opposing lines can accent the sense of powerful resistance to strain, or where the massing and modeling of stone or concrete can convey an intensified feeling of solid and immovable repose. The architect must have no fear of simplicity; he must have the daring to sacrifice the facile commonplaces of stereotyped trimming; he must be ready to forget even the beautiful forms that stock his mental arsenal; he must have the courage to eliminate—and eliminate; a glance at any engraving of the Parthenon may convince him of the value of such sacrifices. His task is not to decorate, but to interpret—to clothe, if you will, but to clothe in a

Preliminary Sketch of the Cross Over

The Cross Over Above the Roadway

Delaware River Bridge, Details
Paul Philippe Cret, Architect

vesture that reveals rather than in a garment that conceals.

In the end, the problem reduces itself to the necessity for a sensitive perception of the character and spirit of metal construction. Up to a point we may cling to the rules; but beauty is an outlaw, eluding the grasp of intellect or of industry, and yielding only to an incommunicable instinct in man which is as lawless as itself. The dogmatist who seeks too conscientiously to obey the canons of an æsthetic theory will fall as far short of achieving a beautiful thing as the indifferent and slipshod workman. There is no justice in art, and the artist knows no conscience but his own instinct. But it is this instinct which, violating law in a spirit of holiness, brings into being the new forms, which, strange and disturbing as they may be at first, in time are seen to be eloquent expressions of a true perception.

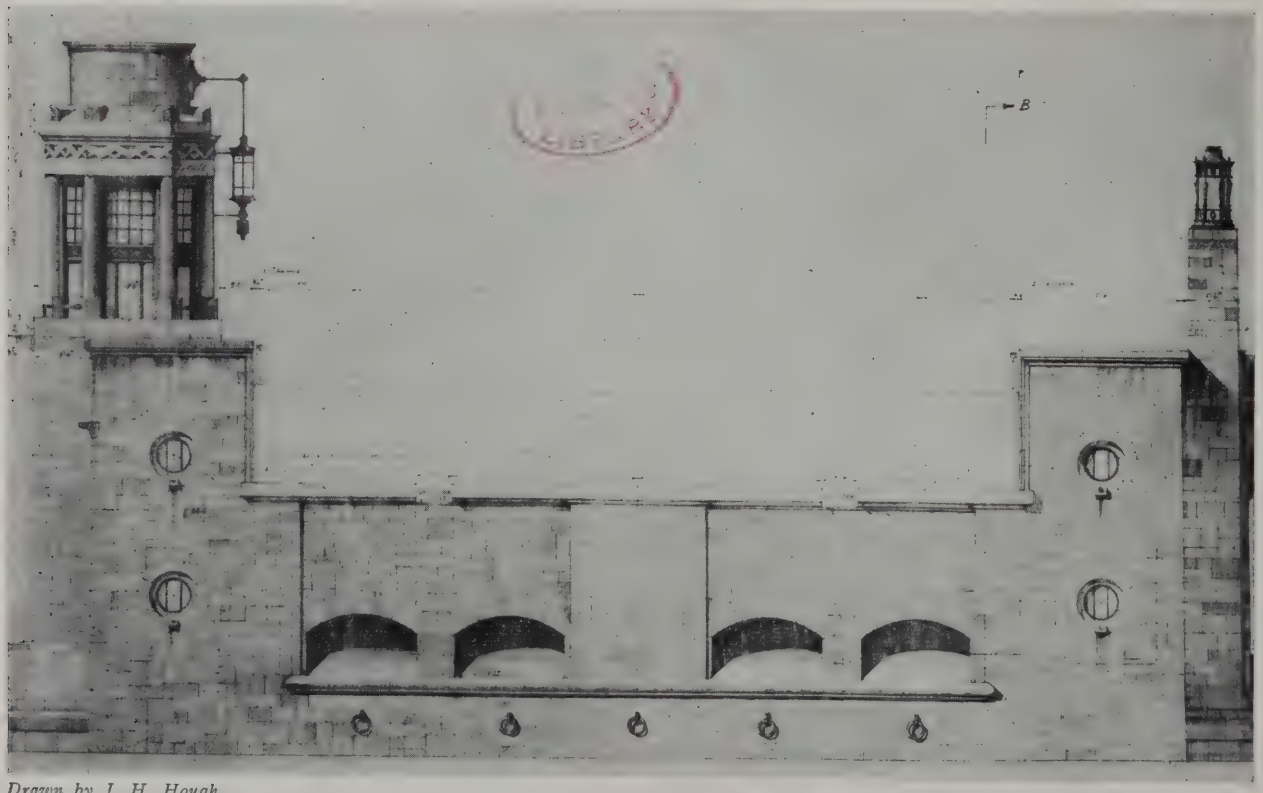
And, finally, it should be remembered that to the creative mind, every change and displacement that time and circumstance develop are elements that enrich rather than limit the means of creation. The creative instinct remains a constant force, strong enough to encounter even the problems that it views with alarm, and insistent enough to master them.

The illustrations accompanying this article are from photographs and drawings of the Delaware River Bridge between Philadelphia and Camden, and of the University Avenue Bridge in Philadelphia. They were selected to illustrate an attempt to harmonize the stonework with the steel construction, and to give architectural value to the steel forms without having recourse to useless members or ornament. It was thought by both the engineers and the architect that, in most cases, ornamentation does not readily become an integral part of the design, but remains, as it were, "tacked on," detracting from the austere beauty of the steel members.

The architect wishes here to acknowledge that his collaboration with the engineers of the Delaware River Bridge, Messrs. Ralph Modjeski, Chairman of the Board; George H. Webster; and Lawrence A. Ball; and with the engineers of the University Avenue Bridge, Messrs. Vogelson, Chief of the Bureau of Engineering; and Noyes, Engineer of Bridges; has been of great assistance to him in restraining the tendency of the architectural "Old Adam" to relapse into too much architecture; and also that his constant intercourse with men of the highest professional merit was a most pleasant experience to him. He realizes that his contribution to the common undertaking is of small value compared with theirs, and claims only the merit of having tried earnestly to understand their points of view in this worthy achievement.

Statistical Data:

Total length of bridge and approaches	9,570	feet
Length of bridge proper	3,535	"
Length of main span	1,750	"
Width of bridge	128	"
Clearance above high water	135	"
Height of towers	380	"
Cost	$36,000.000	



Drawn by J. H. Hough

Sketch of Main Piers, University Avenue Bridge, Philadelphia
Paul Philippe Cret, Architect

ILLUMINATION IN THE PHILADELPHIA MUSEUM OF ART

BY
C. E. WEITZ
ELECTRICAL ENGINEER

ALL of the treasures handed down to us from the past appeal to just one of our senses,—sight. The prime essential in museums, therefore, is that the objects of art may be well seen; this, of course, means that they must be well lighted. As we contemplate art or architecture, we find that each historic period wrote its own chapter, and our present viewpoint is a composite of lessons from the past. In the matter of lighting, however, though the subject is as old as the human race, very little can be safely taken from the past. Modern illumination is a new art, born of the science of the present generation. Its progress is measured in years, not in centuries.

Natural Daylight versus Artificial Daylight. While it is possible to design a building with primarily daylight illumination, it may mean a considerable compromise architecturally. Efforts in this direction have resulted in a distinct type of modern factory building with glass walls, but such a departure would hardly be considered for any building of the monumental type. Furthermore, the lighting requirements of an art museum are such that natural daylight illumination is limited to some extent to that obtained from skylights. With skylight construction, elaborate louver systems are essential to control the direct sunlight and also to overcome the natural tendency toward a maximum illumination on the floor rather than on the walls. Such skylight and louver installations are not only expensive initially but they inevitably impose severe restrictions on the design of the artificial lighting system. The large areas of skylight make the room hot in summer and give rise to expensive heat losses in winter. Questions of leakage, and of the cracking of glass, due to constant expansion and contraction, necessitate an efficient system of maintenance. Again, the latest researches have shown that the fading and discoloration of the pigments in paintings can be minimized, if not eliminated altogether, by the use of artificial light. It was logical, then, that those who have given the art museum problem the most thought should have reached the conclusion that provision of artificial lighting, with its constant quality and 24-hour availability, should be the first and foremost element as far as illumination is concerned.

Daylight Illusion. An illusion of natural daylight in the Philadelphia Museum is obtained through the use of "daylight" incandescent lamps, exclusively. These lamps, with their blue glass bulbs, correct the light of ordinary bulbs to a color not coldly white but of a hue which approximates that of natural light indoors which has been mellowed somewhat by window draperies and the tone of the interior decorations of the room. Nearly one thousand lamps are used to light the portion of the museum now completed. The lamps range in size from 60 to 1000 watts, each definitely and designedly contributing its part to the lighting ensemble. Some are used in floodlight projectors above artificial skylights, others in coves concealed in ceiling ledges, while

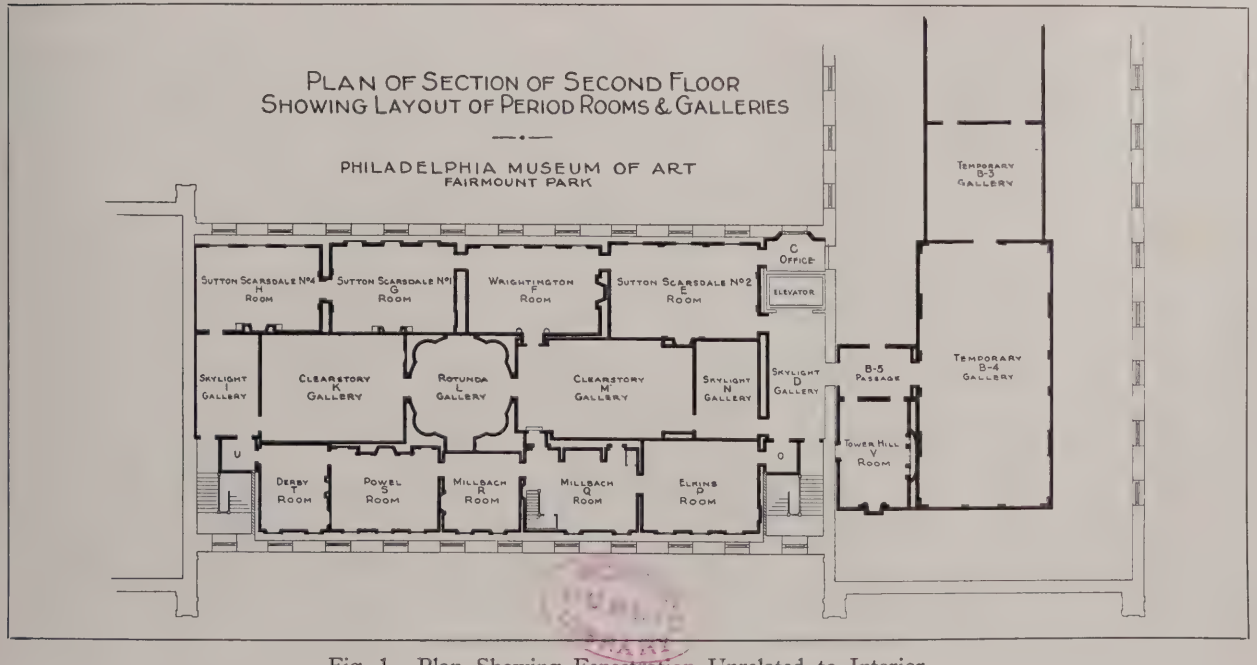


Fig. 1. Plan Showing Fenestration Unrelated to Interior

Fig. 2. Artificial Lighting of Large Gallery

Fig. 3. Mounting of Projectors for Lighting at Left

others are parts of artificial windows,—but not one lamp is exposed to view.

The function of light is to reveal, and as such it should seem to pervade the whole. It should quietly play its part rather than intrude itself upon us. It was with this conception that the lighting problem of the various galleries of the new Philadelphia Museum was undertaken. No matter what words are used to describe the lighting effects, the lighting was planned not to introduce any mystic or esoteric effects, but purely as an unconscious illusion of normal daylight as an unobtrusive part of the whole. Let it be said further, however, that the technique employed is new and unusual, simply because usual methods have often left much to be desired in contributing the subtle but all-important part light should play. The most conspicuous feature of the lighting is the absence of those faults which most of us have been led by long experience to feel are necessary evils of a paintings display,—too strong a light, too weak a light, or dazzling light thrown back from the surfaces of the paintings by reflections of the light sources themselves. How refreshing to find these customary faults non-existent in the Philadelphia Museum! One writer described the lighting as one "of soft, steady daylight everywhere. While the sky was a sooty gray outside, with no hint of the sun, within the rooms a clear, diffused illumination gave the illusion of a June day, with the sun behind light,

Illumination of Large Gallery Wall. Ceiling Reflections Absent

friendly clouds,—and done in such a fashion as to reveal the witcheries of carved panels and painted canvases which transported visitors to the far-off days of the Georges." And that is the effect which those planning the lighting strove to secure. They sought to have the lighting as natural as possible in the many galleries as well as in the period rooms, and it was obtained by unusual arrangements of lighting devices. To supplement some settings, additional light was so directed as to render the most advantageous viewing of the displays.

Five Systems Employed. The portion of the Museum opened to the public for the first time in the latter part of March, consists of a section along the north and east sides of the third or main floor. The main hall at present consists of a series of four temporary galleries, occupying a space approximately 30 by 180 feet; the northeast wing comprises three main sections,—a central series of large and small galleries flanked on either side by a series of period rooms. The arrangement of the various galleries is shown in Fig. 1. The lighting for the galleries has been designed specifically as a part of the architectural treatment, which divides into five general types.

Lighting the Temporary Galleries. The large temporary galleries along the north side are partially ceiled with glass, through which comes a glow of light, soft and diffused. A typical gallery is shown in Fig. 2. Each skylight section is boxed in by a large housing, painted white inside to reflect the light from a number of daylight lamps within. These lamps are mounted well above the glass to give an even distribution of light and to avoid casting apparent bright spots on the skylight. But little dependence, however, is placed on the skylights for the strong, steady light that is essential for the gallery walls. Consequently only enough light comes through the skylight to make the glass softly luminous. Bounding the glass ceiling area on all four sides are

Fig. 4. Small Galleries Are Lighted by Artificial Skylights

beams dropped a foot below the ceiling and extending both lengthwise and crosswise of the room about 5 feet from the walls. In general appearance these beams are no more than supporting members of the ceiling structure, but their primary purpose is to form the housing for the source of the gallery wall illumination. The sides of these drop beams toward the walls are of stippled glass sections behind which are concealed projectors so adjusted as to direct a flood of white light on the picture areas. These projectors, each using a 200-watt daylight lamp, are spaced 2 to 3 feet apart along the beams and are mounted on swivel joints for aiming as desired (Fig. 3). Each plays its own part in the lighting of a definite portion of the wall area of the galleries.

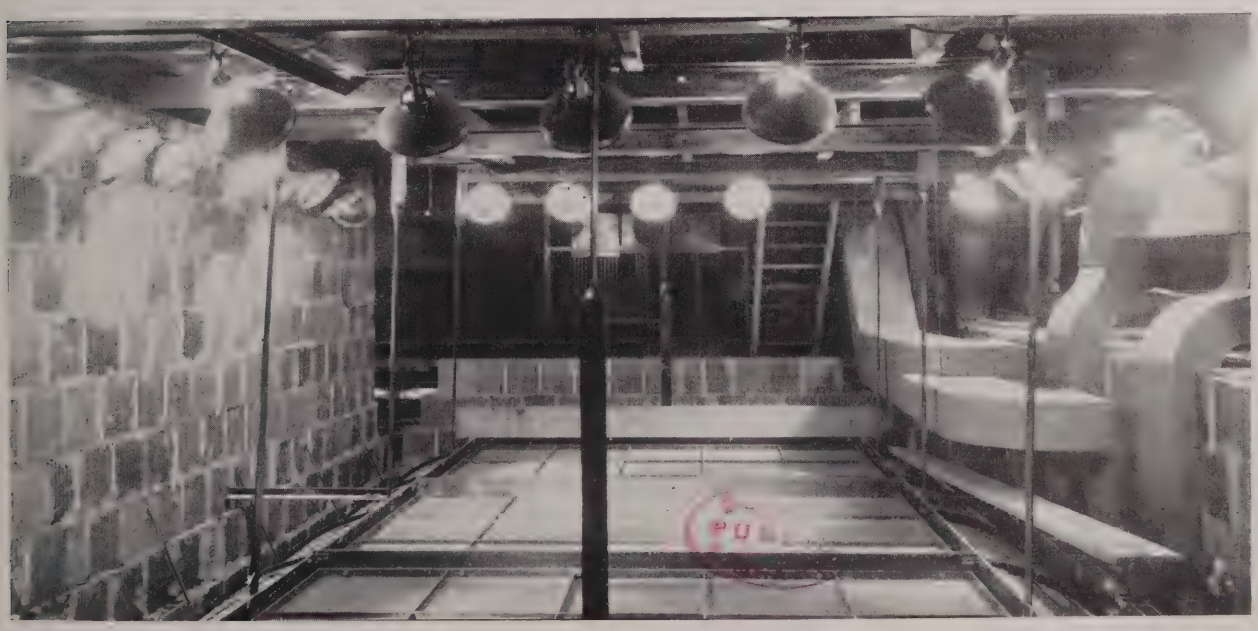


Fig. 5. Projectors Above Skylight Over Small Gallery

Fig. 6. Location of Projectors Behind the Clerestory Lunettes

Three Small Galleries Have Artificial Skylights. In the wing adjoining the large temporary galleries there are three small galleries,—D, N, and I, shown in Fig. 1. They are paneled in velvet of royal scarlet, warm golden brown, and glossy gray. These galleries have skylight construction, but being of smaller sizes do not permit or require the exact lighting treatment just described. Instead, the skylight is the only source of light, but unusual emphasis is given the paintings on the walls by a battery of 28 floodlights above each skylight on all four sides. Each floodlight has a concentrated distribution of light, and is directed at the desired angle toward the walls rather than toward the floor, so that the paintings are adequately lighted and the wall coverings glow with natural velvety luster. A typical gallery of this construction is shown in Fig. 4, while a view of the equipment installed is shown in Fig. 5.

Cove Lighting for Rotunda Dome. The rotunda, which forms the central portion of the northeast wing, is lighted from a concealed cove at the base of the vaulted dome,—daylight lamps, of course. But aside from an effect that is striking, the application is not at all uncommon. This lighting does, however, emphasize the delicate colorings and patterns in the ceiling, while the dome is crowned by a luminous panel behind which can be placed spotlights to highlight statuary in the niches which face a life-sized bronze of Washington standing at the center of the rotunda floor (Fig. 10).

Thousand-Watt Projectors Light Clerestory Galleries. The clerestory galleries, as the name implies, have high arched ceilings as in the nave of a church, with semi-circular windows high up along each side. These galleries join the rotunda on either side. The larger of the two is 26 by 28 feet, and has three windows on each side. Each window is divided into seven radial sections fitted with ribbed glass. Behind the center panel of each window, on both sides of the room, are 1000-watt projectors which direct a cross-spread of light upon the picture area of the opposite wall. The other six panels of each window are backed up with a sheet metal housing within which are several 200-watt daylight lamps to make the entire window luminous. Fig. 6 shows where the projectors are located. A view of one of these galleries is shown in Fig. 7. The effect is that of natural daylight streaming in through the clerestory.

Unusual Lighting Methods in Period Rooms. Perhaps the most unusual treatment is manifest in the period rooms,—particularly so if we seek to emphasize the departure from architectural precedents so increasingly necessary if the full potentiality of lighting is to be gained. There are four English rooms of the period from 1724 to 1754, taken in their entirety from Sutton-Scarsdale and Wright-

Fig. 7. Clerestory Lunettes in Large Gallery

ington Hall, also a room from Treat House, Upminster, and a Tower Hill room. There are four American rooms, one from the Powel house, Philadelphia, where Washington, Lafayette, and Franklin stopped when they came to Philadelphia. There, too, dashing British officers entertained, while Washington and his men lay at Valley Forge. Another room is from the Derby house, Salem, and there are two Pennsylvania Dutch rooms from the Muller house, Millbach, Pa.

These rooms indicate the scope and excellence which will make the new Museum famous throughout the world of art. They are originals, transplanted with meticulous care to this new and stately building which crowns Philadelphia's acropolis. There are the golden brown fumed oak wainscotings of Sutton-Scarsdale with the tragic, deathless loveliness of Lady Hamilton looking down from one great canvas, surrounded by other Romneys, Gainsboroughs, and Raeburns of the McFadden collection. Since these rooms are set bodily within the walls of the Museum, use of natural daylight alone was impracticable; still, if the rooms were to retain their character and charm, the daylight effect was necessary. Strong shafts of direct sunlight through these windows, while producing a very natural effect, might be bright enough to obliterate details of paintings along certain sides of the rooms. When these rooms were reconstructed within the Museum, a small space was provided between the building's walls and the outside walls of the rooms. This allows some diffusion of natural daylight to filter in through the inner windows, but by dropping white curtains outside the rooms' windows a soft diffused artificial light is reflected into the rooms. Daylight lamps mounted around the outer edges of the window frames direct their light to these curtains, and this is particularly true of the Tower Hill Room, giving a pleasing daylight effect. In this case, as will be noted by reference to the plan shown in Fig. 1, the windows actually look out upon the walls of the temporary gallery which have been curved around and direct into the room the light from concealed lamps.

Though such a scheme creates the illusion of natural lighting, it is not satisfactory as the primary lighting in those rooms. To light, effectively and unobtrusively, the wainscoting and the paintings which grace the walls, a scheme similar in principle to that described for the temporary galleries is used. Instead, however, of beams dropped from the ceiling to conceal supplementary equipment, we find a unique departure from architectural precedent. In order to accommodate floodlight projectors to light the walls predominantly, the architects have, in effect, taken a sharp knife and cut through the ceilings about 4 feet from the walls all around. Then the

Fig. 8. The Sutton-Scarsdale Room

inner edges of this incision are bent down about 6 inches, leaving the central portion of the ceiling in a gracefully curved arch. This allows a band of stippled glass to be inserted,—or a cove, if one will,—into the ceiling, behind which are mounted floodlights which sweep the walls. The drawing in Fig. 9 shows this, while Fig. 8 shows the lighting results as obtained in the Sutton-Scarsdale Room.

The question was asked of Mr. Borie, one of the architects, how, in architects' parlance, this type of ceiling would be designated. He naïvely answered, "Plaster." And, so it seems, the Philadelphia Museum shows architectural departures in reference to illumination results at almost every turn. This pioneering spirit in an architectural way evidences faith in the plans of the lighting of the Museum.

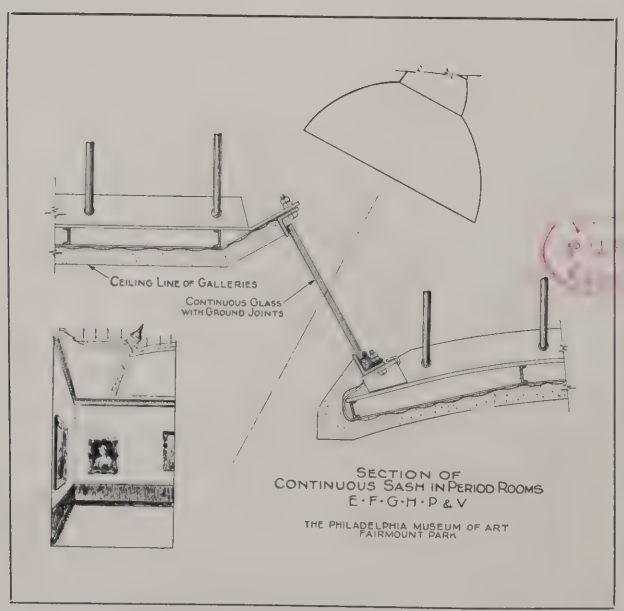


Fig. 9. Diagram of Lighting of Sutton-Scarsdale Room and Other Period Rooms

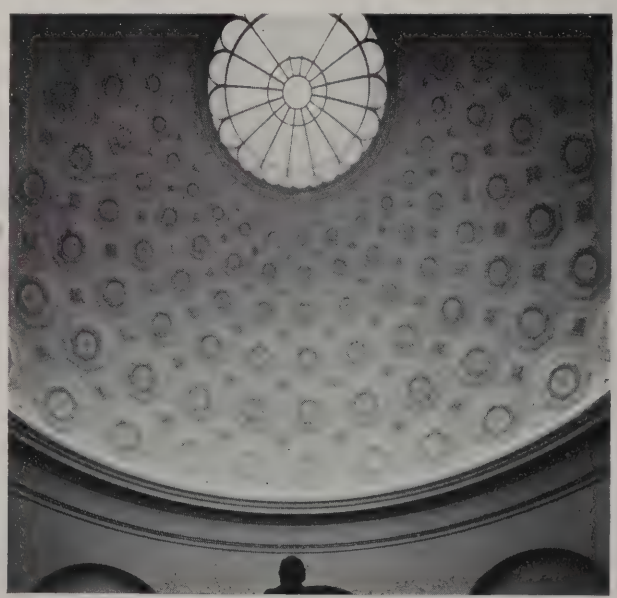


Fig. 10. Artificial Lighting of the Rotunda Dome Reveals the Coloring and Design

THE STRUCTURAL FRAME OF THE NEW TEMPLE EMANU-EL BUILDING

BY

EUGENE W. STERN

CONSULTING STRUCTURAL ENGINEER

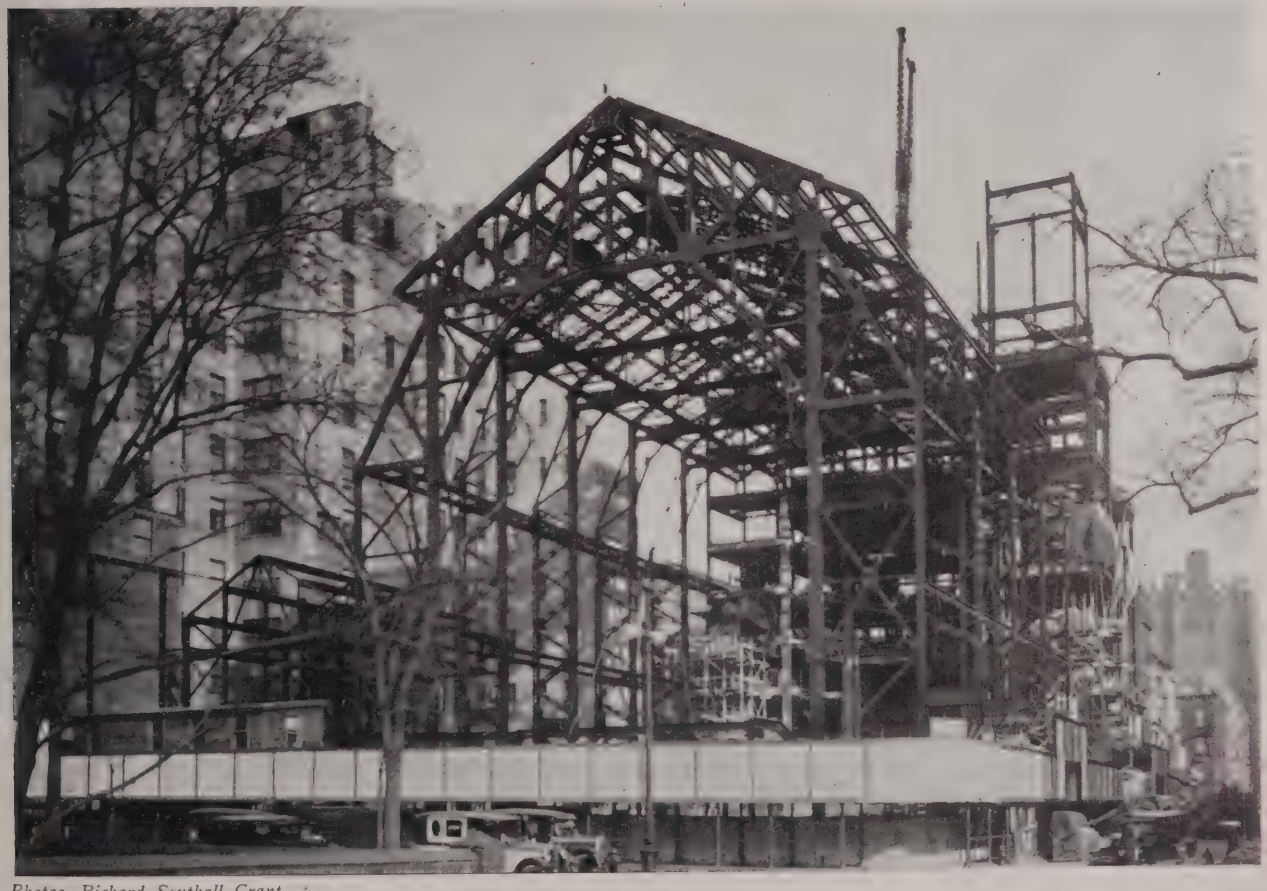
THE structural frame of the new Temple Emanu-El building in New York is principally of steel construction, but portions are of reinforced concrete as well as masonry, the material chosen being that best adapted to suit the particular condition.

General Description. The structure is in reality a group of three buildings,—the Temple proper, the Beth-El Chapel, and the Community House. The Temple proper is a large auditorium, 100 feet by 176 feet, seating in all 2,500 people, of whom over 2,000 are accommodated on the main floor and the remainder principally in the west gallery. All seats are so placed as to provide a view of the ark and the pulpits. Of the total length of the auditorium, about 25 feet are taken up by the sanctuary, which is separated from the main body of the auditorium by an arch about 40 feet in width.

To the north of the Temple is the Beth-El Chapel, about 50 feet by 100 feet, a two-domed structure with a separate entrance from Fifth Avenue. This chapel has been planned to seat about 325 persons, the only gallery being a small choir gallery at the west end.

To the east of Temple Emanu-El is the Community House, which is an eight-story building, 100 feet deep. The main body of the structure is about 50 feet in width and has an entrance vestibule and elevator tower, placed on the 65th Street side between the Temple and the Community House. The tower is about 175 feet high to the top of the stonework. The Community House contains, on the ground floor, a large auditorium; on the second floor, the offices of the Temple and the library; and on the next five floors, classrooms; while the eighth floor includes the rabbis' studies, trustees' room, etc.

Temple Emanu-El. The nave of the Temple is 77 feet wide, 147 feet, 6 inches long, and 103 feet high, from floor to ridge of ceiling. The columns supporting the trusses are built in the form of a trussed frame 8 feet deep, designed to carry 30 pounds per square foot horizontal wind pressure. The roof trusses, spaced 27½ feet apart, have trussed top chords, the tops of which are in the plane of the roof and the bottoms in the plane of the ceiling, as may be seen in these illustrations. The bottom chords of these trusses are horizontal members and are exposed. The web members of the trusses are not visible, being hidden by the ceiling, as they are in the space between the ceiling and the



Photos. Richard Southall Grant

The Frame of Temple Emanu-El from Fifth Avenue

The Main Roof Trusses

Looking Toward Central Park

roof. This design of truss, having a system of triangular web members which supports both the roof and ceiling, is readily analyzed for stresses, being statically determinate, and was quite the most economical design that would meet the conditions of the problem. The walls are of masonry, reinforced concrete and brick faced with limestone, and are self-supporting, except the clerestory, which is carried on reinforced concrete girders at a level of 61 feet above the first floor. These girders are supported on reinforced concrete columns.

The front of the building on Fifth Avenue has a reinforced concrete frame and arch, 108 feet high, from the street level to the roof, which carries the load of the roof to the foundations. The stone facing supports itself and is anchored to the concrete. In the basement of the Temple there is a banquet room, of 50 feet clear width between the columns which support the main floor. By using a cantilever system of floor beams it was possible to support the first floor on 20-inch beams about 9 feet on centers.

Bracing. Adequate bracing, both vertically and horizontally, has been provided, some of which is temporary and will be removed after the reinforced concrete and masonry work of the enclosing walls are completed. In general, the bracing consists of 1-inch rods with turnbuckles, and struts made of two channels riveted together in the form of a T.

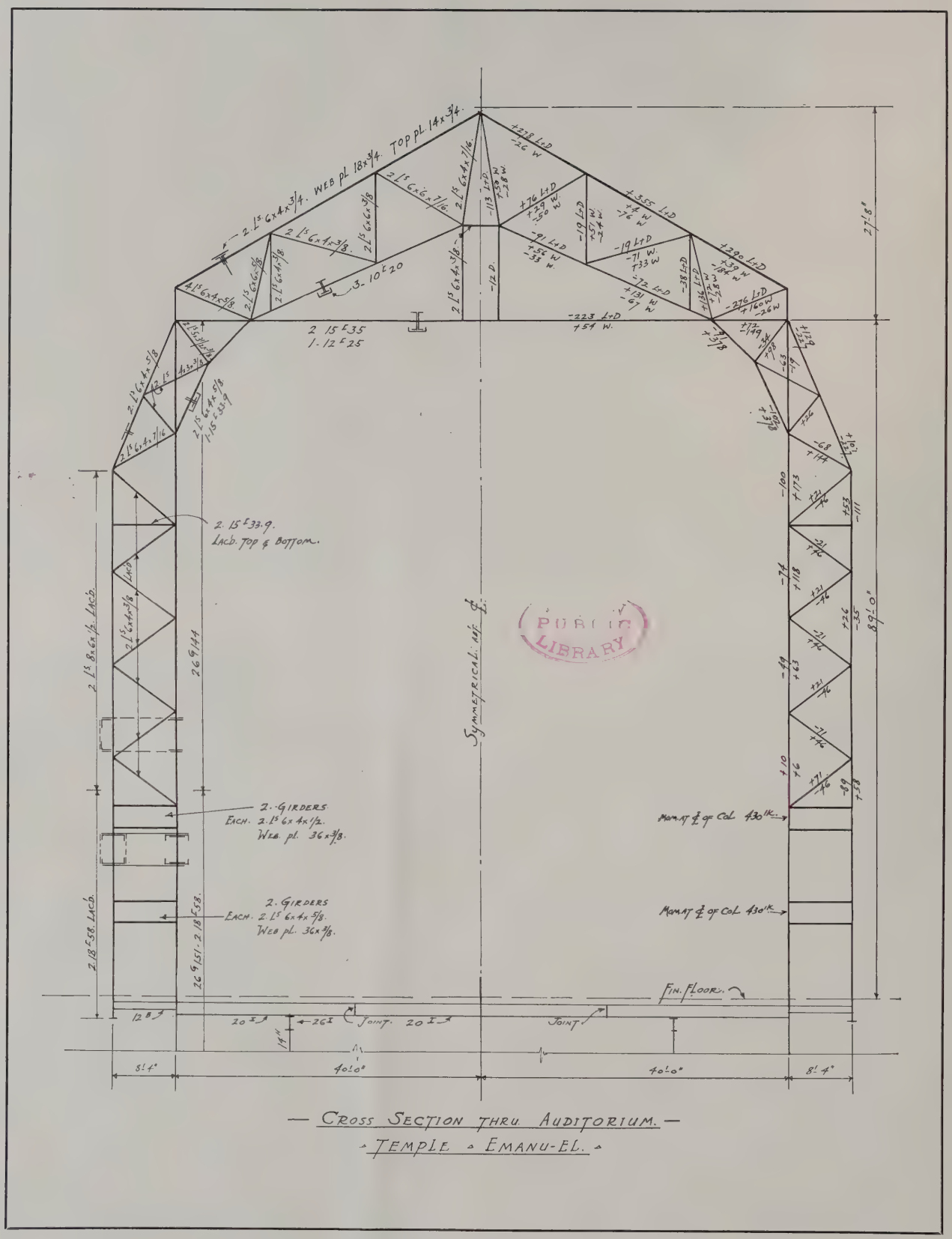
Chapel Beth-El. The structural frame of the Chapel is quite simple, there being nothing unusual in the problem of supporting the roof and the domed

Main Roof Trusses as They Will Appear When Finished

ceiling, which is hung from trusses. The decorative masonry of the interior is practically all self-supporting or carried on reinforced concrete construction.

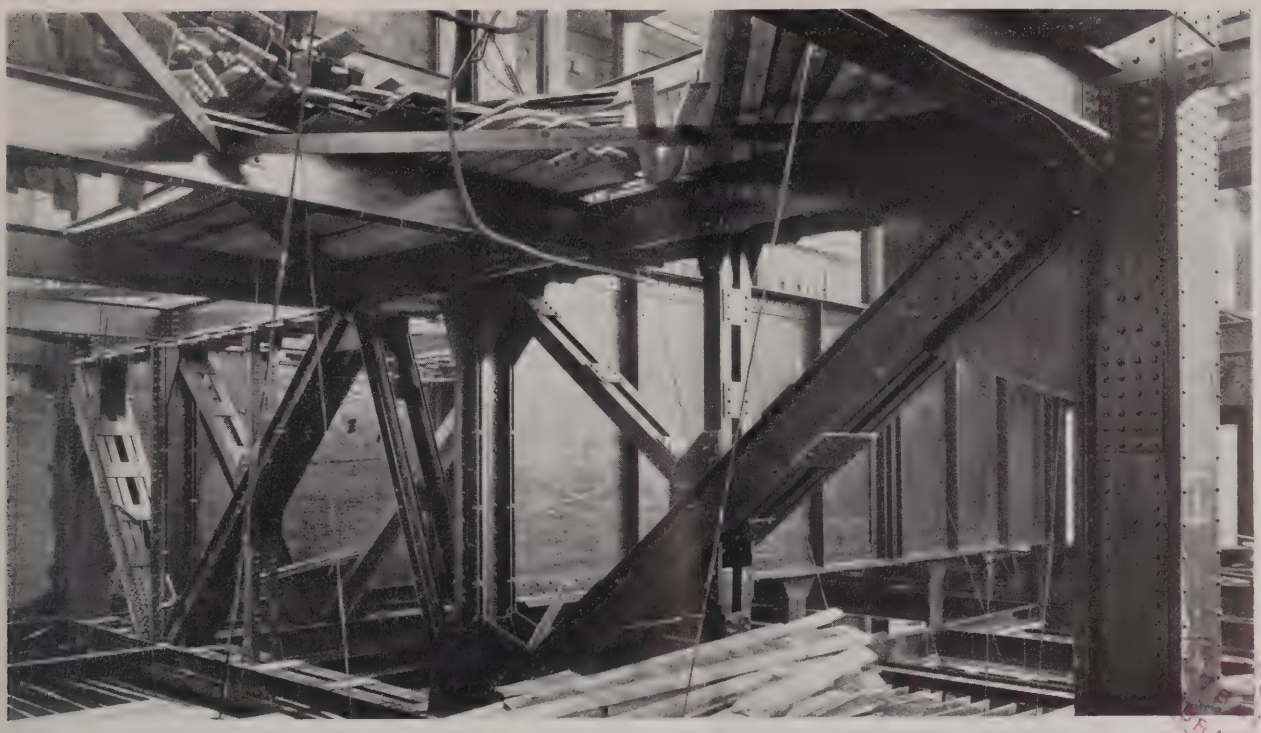
Community House. This building is eight stories in height and is designed for a future extension of two stories. The first story provides an auditorium with gallery, and it was, of course, necessary to have this space free of exposed columns. To accomplish this all the interior columns which carry the upper floors were supported at the third floor on a system of trusses, whose depth is the full story height of the second story. There are three trusses 14½ feet deep and one plate girder 10 feet deep, which support the framing of all floors above the auditorium. These trusses, therefore, carry heavy loads, and one of them has a span of 47½ feet and supports 1100 tons. In the design of these trusses the details are so arranged that in all field connections the rivets are in double shear, thus reducing the number of field rivets to a minimum, and allowing the use of smaller gusset plates at the connections,—an important matter, inasmuch as door, corridor, and window openings had to be provided for in the design of the web system of these trusses. In Truss T-1 the main top chord compression member is a box section made up of four 15-inch channels, 55 pounds per foot, with 22-inch cover plates 1¼ inches thick. All steel trusses and connections of columns to trusses were assembled in the shop, and all holes for field connections were reamed or drilled through the solid metal. This proved to be very satisfactory in every way and saved materially in the cost of erection, as

Supports and Bracing



— Cross Section thru Auditorium. —
Temple Emanu-El.

DIAGRAM OF STRUCTURAL FRAME OF THE AUDITORIUM
TEMPLE EMANU-EL, NEW YORK
ROBERT D. KOHN, CHARLES BUTLER AND CLARENCE S. STEIN, ASSOCIATED, ARCHITECTS
EUGENE W. STERN, CONSULTING STRUCTURAL ENGINEER



View of Truss Supporting Community House

the pieces were fitted together in the field without any reaming or drifting.

Floor Construction. Owing to the difficulty of obtaining clean anthracite cinders in New York, it was deemed undesirable to use cinder concrete in the floors. Stone concrete of 1:2:4 mix, and combination tile, one- and two-way systems, and reinforced concrete floors have been used throughout. In the Temple the main floor slab is 4-inch reinforced concrete, supported on steel beams spaced about 9 feet apart, the reinforcing consisting of ⅜-inch round bars spaced about 5 inches on centers placed diagonally in two directions so as to accommodate the openings for ventilating sleeves. The roof consists of a 3½-inch reinforced concrete slab on which there is a 2-inch layer of nailing concrete in which are 2 by 3-inch wood nailing strips spaced about 2 feet apart, to which the covering of copper is attached. In the Chapel Beth-El the floor construction is entirely of reinforced concrete with reinforced concrete girders and hollow tile concrete ribbed floor slabs. The floors of the Community House are similar, consisting of one- and two-way hollow tile and concrete ribbed slab systems on steel girders.

Robert D. Kohn, Charles Butler and Clarence S. Stein, associated, were the architects, and Mayers, Murray & Phillips the consulting architects. The author was the structural engineer. The structural design of the building was planned solely to meet the architectural and structural requirements.

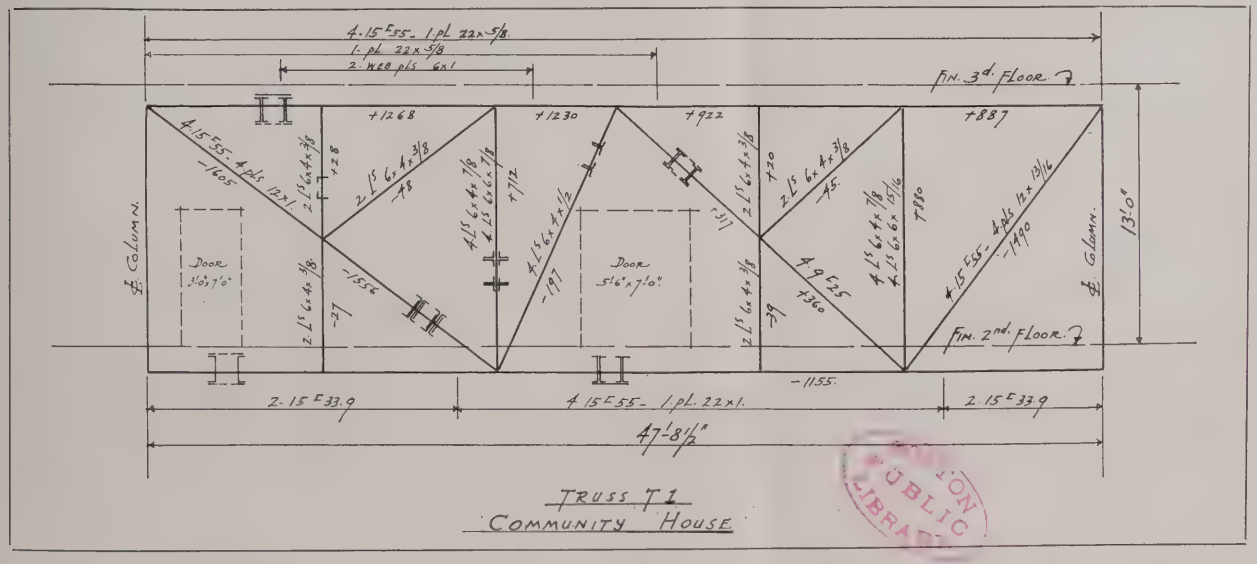


Diagram of Truss Supporting Community House

GENERAL VIEW OF STRUCTURAL FRAME
TEMPLE EMANU-EL AND COMMUNITY HOUSE

CHOOSING AND SPECIFYING LUMBER

BY
G. E. FRENCH and A. T. UPSON
ENGINEERS, NATIONAL LUMBER MANUFACTURERS' ASSOCIATION

LONG before King Solomon called on Hiram of Tyre for cedars of Lebanon and sent four score thousand woodsmen into the mountains of Judea to cut and hew timbers for his temple, wood was one of the most extensively used and important building materials. It still is. Not until the second decade of the twentieth century, however, was there available exact knowledge of its physical and mechanical properties.

Today conditions are different. As a result of the present keen competition, which is the life of modern business, lumber manufacturers, lumber distributors, engineering organizations, and research departments of the federal government have seen fit to lift the mystic veil enshrouding the properties of wood so that it may be compared property for property with competing materials. With this have come lumber standardization, plans for grade marking lumber, better merchandising, and the free advisory and consulting service of organized lumber manufacturers for the specifiers and consumers of their products in matters of lumber specification, procurement, and utilization. The aim of this article is to place before architects the technical information developed through research by such organizations as the American Society for Testing Materials, the U. S. Forest Products Laboratory, the Department of Commerce, and various trade associations, in a form that will be of practical assistance to them in the selection of woods, the designing in wood, and in writing the subsequent specifications. Wood is a product of nature, and no two creations of nature are exactly alike. Between the extremes there is considerable difference. The variations in lumber, except in rare instances, are readily discernible, however, so that it is possible to select, sort, and grade wood for a particular use with the assurance that the material will give satisfactory service. It is this service, this selection of the right kind, the proper grade, the right size of lumber for each of a multiplicity of uses, that is claiming the closest attention of progressive lumbermen, and this service is being offered the architect today.

Structure of Wood. Wood is a highly complex material, composed of masses of various types of tube-like cells. Some of these cells are thin-walled and adapted to the passing of liquids in the growing tree; others serve as food storage cells; and still others function primarily as strength tissue. Most of these cells have their long axes parallel to the main axis of the tree. In some species, however, as high as 25 per cent of the cells may have their long axes at right angles to the main axis, extending out like radii from the pith or center of the tree. These are known as "wood rays" and play an important part in the properties of wood. They also impart the beautiful figure to quarter-sawn boards of such woods as the oaks and gums. These variations in cellular structure, these anatomical differences, are responsible for the character and individuality of our different species of woods. It is due to these characteristic cellular differences that some species have a beautiful figure or grain, that some are resistant to impact, that some have great stiffness, that some are resonant, and that still others are capable of being bent and shaped into many forms, all demonstrating wood's great adaptability.

In the hardwoods or broad-leaved trees, such as oaks, maples, birches, elms, and basswood, the mixture of various types of cells is rather heterogeneous throughout each annual layer of wood laid down about the tree, though some have more uniformity than others. In the softwoods or needle-leaved trees, such as the pines, spruces, and firs, there is considerable uniformity in the type of cells. In the springwood they are usually large and thin walled. Later in the year the cells formed are smaller in diameter and have much thicker walls. The percentage of summerwood thus formed in Douglas fir and southern yellow pine, is readily discernible to the unaided eye, and is one of the most accurate criteria by which to judge the relative strength values of pieces of either species. Structurally there is little difference between sapwood, the living portion of the wood in a tree, and heartwood, the matured portion; and contrary to general belief, there is practically no difference in mechanical properties of otherwise similar materials. Sapwood is less resistant to decay than heartwood, but incidentally it is more readily treated with artificial preservatives. Straight-grained material, so desirable where strength is required, has the long axes of the cells parallel to two adjacent sides of the board or timber into which it is cut. Frequently the direction of these fibers is not parallel to the axis of the board, due either to the distortion of the fibers around a knot, that portion of a branch contained within the tree trunk; to non-uniform growth of the trunk of a tree; or to improper manufacture in the sawmill. Such material is termed "cross-grained," and when the slope of grain is pronounced it is unsuitable for use in heavy duty construction. The limits of permissible cross grain are defined in structural grading rules.

Knots in lumber may be either "tight" or "loose." Knots formed during the growing life of a branch are tight because of the close union between the fibers of the branch and those of the stem. When the branch dies, this close bond or union ceases, and the tree merely grows around the stub of the dead

branch. This type of knot is known as "loose" or "not firm," inasmuch as such knots may fall out during lumber seasoning processes. Knots in a quarter-sawn surface of a board are termed "spike" knots because of their long, slender appearance. Knots on a flat or plain-sawn board are oval or round. The locations and sizes of knots in material where strength is of primary consideration are important and always rigidly controlled by inspection rules. Lumber may contain other defects, some of one kind in one species, of another in others. Many of these have little no no damaging effect on the use of the piece, because their prevalence is also rigidly controlled by grading rules.

Dryness of Lumber. Lumber manufacturers today are devoting more thought, more skill, and more technical study to the seasoning of lumber than to any other one problem in its manufacture, due to the close relationship existing in wood between the degree of dryness and its various physical and mechanical properties, and suitability for various uses. When a tree is cut in the forest, sapwood may contain a greater amount of water by weight than wood substance. In the heartwood, water may be present to the extent of from 30 to 50 per cent of the oven dry weight of the wood. Boards cut from such material immediately begin to lose their moisture by evaporation. The percentage of water retained in the board depends entirely upon the humidity of the air to which it is subjected. In air with a relative humidity of 90 per cent, lumber will have an average moisture content of 22 per cent; at 60 per cent relative humidity, a moisture content of 12 per cent; and at 30 per cent relative humidity, a moisture content of 6 per cent. If the humidity of the surrounding air changes materially, then the moisture content of the lumber changes also. The rate at which this change takes place depends to some extent on the species involved, the protective coating of the wood, the dimensions of the piece in question, and the temperature and circulation of the air in contact with the wood. It is slow in any event. Change in moisture content is important as far as the properties of lumber are concerned. Loss of moisture below 25 per cent of the oven dry weight of the wood is associated with a decrease in size but with an increase in strength properties. The converse of this also holds true. The rate of change in moisture and method of change is also important. Too rapid a change in moisture content may cause uneven drying with subsequent warping or checking. The seasoning of lumber is, as a result, work which must be carefully supervised.

Frequently heard these days is the complaint "lumber is not seasoned as it used to be." It isn't! It is seasoned far better by the better mills of today than ever before. It is done accurately and under the supervision of skilled operators. There are two real reasons for the complaints mentioned. One of these is that many builders refuse to pay the slight additional cost of properly seasoned lumber and take chances with green lumber. Another reason is that the conditions to which lumber is subjected in the modern home are far more exacting than ever before. It is easy to recall the period when one or two rooms in a house were heated by a stove in the winter and the rest of the rooms were cold. Humidities were not low, and air-dried lumber would change but little even in the heated rooms during the winter. Living standards have changed. It is now quite generally the custom to heat all of the house to 70 or 75°. Relative humidities of 30 per cent or lower obtain for long periods with subsequent loss of moisture and shrinkage of wood not properly seasoned for these new conditions. It is not that lumber is poorer than it used to be or that it is not seasoned well; it is usually the fault of some individual who refuses to study the influence of this new era of well heated homes upon the requirements for dwelling houses. Lumber must be properly seasoned to stand the new conditions. Lumber conditioned by the manufacturer for particular uses can be shipped a long distance in box cars without appreciable changes in moisture content. Considerable responsibility therefore rests with the retail distributor and with the contractor. Kiln-dried flooring and finish should always be stored in closed, rainproof sheds. If a few steam coils are present, so much the better. Such stock should not be taken to a building until the windows and doors are in and the plaster has lost most of its moisture. If such precautions are taken, joints in the trim will remain tight and snug. Floors will not open up or squeak. The good service expected of lumber will be had.

Durability. The question, "what is the length of life that may be expected of wooden buildings?" cannot be answered in a simple statement of the number of years. Much depends on the species used, the possibility of there being insect and fungus attacks, mechanical injury and wear, the conditions under which it is used and permitted to be used, and so on. In Sweden lumber has long been abundant and extensively used as a building material. Today there are many Swedish buildings, built entirely of wood, put up in the latter part of the seventeenth and in the eighteenth centuries. Along our eastern coast in the older settled parts of this country there are many wooden structures from 100 to 200 years old. Frequently it is not deterioration of the material which determines the life of these buildings. A large number of our old houses have been torn down to make way for new buildings with modern improvements and conveniences, or for business structures. Obsolescence, therefore, accounts for much of the change from one type to another, from one material to another,—not depreciation of the material itself. The long natural life of some species, such, for example, as cypress, redwood, the cedars, and others, even under adverse conditions, is proverbial. The life of certain other species under conditions favorable to decay, is shorter. The sapwood of practically all species is not as resistant to

decay as heartwood. A listing, however, of the various species according to their relative durability is impractical because as yet there has been devised no scale for measuring this property. But a knowledge of decay will go far toward eliminating trouble from this hazard.

Decay. This may be caused by any one of several fungus organisms. These organisms put out thread-like roots or *hyphæ,* which pierce the cell walls, rendering the wood first brash and, in the most advanced stages, worthless. Decay can develop only where the temperature is satisfactory, where there is sufficient moisture, and where there is a certain amount of air. If any one of these three conditions is not favorable, fungi cannot develop. In normal building practice one condition that can be readily controlled is the supply of moisture. It is impossible for decay to develop in timber the moisture content of which is below 20 per cent if the fungi have no outside source of available water. Air-dry material, in any of the well developed sections of this country, will have less than 20 per cent moisture content. The problem therefore is to design structures so that moisture will drain quickly from all portions of the wood members and as far as possible to provide for a circulation of air around such members. This free air movement will keep the lumber below the critical moisture content. It is likewise important to see that wood members of structures do not come in contact with other wood members which are in contact with a supply of water unless the latter are treated with a preservative.

Preservation of Wood. Fortunately, scientific research has provided us with practical means for arresting the progress of decay or entirely preventing it, even under most adverse conditions, in woods normally not resistant to decay. This is brought about by rendering wood toxic to decay by impregnating it with a preservative material. There are two general types of preservatives on the market,—those which will not leach out of treated material even though such material be soaked in water for long periods of time, and those which will leach out if permitted to remain in water for an extended period. Creosote is the outstanding example of the non-leaching preservative. It is the most commonly used preservative in this country at present and is efficient against both fungus and insect attack. There are various methods of applying it, depending on the species of wood and the use for which it is intended. It is perhaps unnecessary to discuss it in detail here, but full information can be secured from the American Wood Preservers Association, 10 South La Salle Street, Chicago. A disadvantage of creosote is that it is oily and black. It should not be used where people will rub against it, nor should it be used where it is the intention to paint the wood. Where these two qualities are not objectionable, creosote is usually the preservative preferred at the present time in this country,—a preservative widely used.

Zinc chloride, a common preservative, second in importance to creosote, will leach out of treated material under certain conditions. It is, however, effective against both insects and fungi. Wood treated with it is clean and can readily be painted. Other meritorious preservatives such as certain salts, zinc meta-arsenite, and sodium fluoride, are also used in this country. Any of these preservatives will give splendid results when properly used. Zinc chloride, certain salts and sodium fluoride should not be used where treated material is subjected to a continuous leaching action of water. Under such conditions, creosote, zinc meta-arsenite, or a similar preservative should be used. Paint has long been considered a preservative by the layman. As a matter of fact, paint is not a preservative in the sense that it renders wood immune to fungus and insect attack. It does have preservative action in that it retards the weathering of wood exposed to the elements, protects it to a large degree from mechanical wear, and retards the absorption of water from the air. If a sufficient amount of moisture is present in the wood before painting, decay can progress behind the finest coat of paint. No plans or specifications for permanent wood construction should be considered unless they have been carefully checked to insure all members against decay, either through cutting off all sources of moisture necessary for the development of decay-causing organisms, or through the specifying of either naturally decay-resistant woods or properly treated material for members where hazard due to decay is otherwise unavoidable.

Mechanical Properties. In the selection of the kind of lumber for a given purpose, two considerations should be given precedence over the factor of cost. Consideration should be given, first, to securing members of the proper species and dimensions to satisfy the demands of strength and stiffness. Next should come attention to those requirements other than stress values, such as hardness and nail-holding strength which must be met in the design of the project. During recent years the U. S. Forest Products Laboratory has carried on an exhaustive series of tests of all commercial domestic species of lumber. A large number of these tests were made of small, clear pieces. To determine the influence of knots, shakes, checks and other types of defects, however, a sufficient number of tests were made of timbers of large sizes to establish the relation of these defects to strength properties. These data were used in the establishment of American standards for structural grades, generally accepted by the trade. The stress values in Tables 1 and 2, included here, determined by the U. S. Forest Products Laboratory, have been accepted by the American Society for Testing Materials, the American Railway Engineering Association, and the Bureau of Standards of the Department of Commerce. It is to be noted that different values are recommended for timbers of the same grade and species for different locations with respect to degree

TABLE 1

ALLOWABLE UNIT STRESSES FOR STRUCTURAL LUMBER AND TIMBER

Allowable Unit Stress in Pounds Per Square Inch

Species of Timber	Average Weight per cu. ft. at 12% M. C.	American Standard Grade	Bending Stress: In Extreme Fiber: Usually wet 4" & thinner	Bending Stress: In Extreme Fiber: Usually wet 5" & thicker	Bending Stress: In Extreme Fiber: Occasionally wet 4" & thinner	Bending Stress: In Extreme Fiber: Occasionally wet 5" & thicker	Bending Stress: In Extreme Fiber: Continuously dry All sizes	Horizontal Shear	Compression Stress: Parallel to Grain: Usually wet	Compression Stress: Parallel to Grain: Occasionally wet	Compression Stress: Parallel to Grain: Continuously dry	Compression Stress: Perpendicular to Grain: Usually wet	Compression Stress: Perpendicular to Grain: Occasionally wet	Compression Stress: Perpendicular to Grain: Continuously dry	Modulus of Elasticity
Cedar, western red	23	Select	670	750	710	800	900	80	650	700	700	125	150	200	1,000,000
		Common	570	600	600	640	720	64	520	560	560				
Cypress, red	32	Select	800	900	980	1100	1300	100	800	1000	1100	225	250	350	1,200,000
		Common	680	720	830	880	1040	80	640	800	880				
Douglas fir (Coast type)	34	Dense Select	1050	1165	1370	1515	1750	105	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	90	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	72	680	800	880	200	225		
Douglas fir (Mountain type)	30	Select	620	700	800	900	1100	85	700	800	800	200	225	275	1,200,000
		Common	530	560	680	720	880	68	560	640	640				
Fir, (commercial white)	27	Select	710	800	800	900	1100	70	650	750	800	200	225	300	1,100,000
		Common	600	640	680	720	880	56	520	600	560				
Hemlock, west coast	28	Select	800	900	980	1100	1300	75	800	900	900	200	225	300	1,400,000
		Common	680	720	830	880	1040	60	640	720	720				
Hemlock, eastern	28	Select	710	800	800	900	1100	70	600	700	700	200	225	300	1,100,000
		Common	600	640	680	720	880	56	480	560	560				
Larch, western	36	Select	800	900	980	1100	1200	100	800	1000	1100	200	225	325	1,300,000
		Common	680	720	830	880	960	80	640	800	880				
Oak, (commercial white & red)	46	Select		1000		1200	1400	125	800	900	1000	300	375	500	1,500,000
		Common		800		960	1120	100	640	720	800				
Pine, southern yellow	39	Dense Select	1050	1165	1370	1515	1750	128	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	110	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	88	680	800	880	200	225		
Pine, Norway	33	Select	710	800	890	1000	1100	85	700	800	800	150	175	300	1,200,000
		Common	600	640	760	800	880	68	560	640	640				
Pines, lodgepole, Calif., Idaho & no. white, pondosa, sugar	27	Select	670	750	710	800	900	85	650	750	750	125	150	250	1,000,000
		Common	570	600	600	640	720	68	520	600	600				
Redwood	30	Select	710	800	890	1000	1200	70	750	900	1000	125	150	250	1,200,000
		Common	600	640	760	800	960	56	600	720	800				
Spruce, red, white, Sitka	27	Select	710	800	800	900	1100	85	650	750	800	125	150	250	1,200,000
		Common	600	640	680	720	880	68	520	600	640				
Tamarack, eastern	37	Select	800	900	980	1100	1200	95	800	900	1000	200	225	300	1,300,000
		Common	680	720	830	880	960	76	640	720	800				

TABLE 2

SAFE LOAD IN POUNDS PER SQUARE INCH OF CROSS SECTIONAL AREA OF SQUARE AND RECTANGULAR TIMBER COLUMNS (*Dry Locations*)

Ratio of Length to Least Dimension L/d

Species of Timber	American Standard Grade	L/d 10 lbs.	L/d 12 lbs.	L/d 14 lbs.	L/d 16 lbs.	L/d 18 lbs.	L/d 20 lbs.	L/d 25 lbs.	L/d 30 lbs.	L/d 35 lbs.	L/d 40 lbs.	L/d 50 lbs.
Cedar, western red	Select	700	686	674	656	629	592	438	304	224	171	110
	Common	560	553	547	538	524	505	425				
Cypress, red Larch, western	Select	1100	1063	1030	981	909	810	526	365	268	206	132
	Common	880	861	843	818	781	729					
Hemlock, west coast	Select	900	885	872	852	823	783	614	426	313	240	153
	Common	720	712	706	696	680	660	573				
Hemlock, eastern Fir, com'l. white	Select	700	689	678	664	641	611	482	335	246	188	121
	Common	560	554	549	542	530	515	449				
Oak, white and red	Select	1000	982	967	943	908	860	658	457	336	257	164
	Common	800	790	783	771	753	728	625				
Pines, Calif., Idaho & no. white, lodgepole, pondosa, and sugar	Select	750	733	718	695	663	617	438	304	224	171	110
	Common	600	591	583	572	556	532	434				
Pine, southern yellow Douglas fir	Dense Select	1285	1251	1222	1176	1112	1022	702	487	358	274	175
	Select	1175	1149	1127	1093	1045	975	702				
	Common	880	870	861	847	826	796	675				
Pine, Norway Spruce, red, white and Sitka. Douglas fir (mountain type)	Select	800	786	774	753	726	688	526	365	268	206	132
	Common	640	632	627	617	602	582	500				
Redwood	Select	1000	972	947	910	856	781	526	365	268	206	132
	Common	800	786	773	754	726	688					
Tamarack	Select	1000	976	955	923	877	817	570	396	291	223	142
	Common	800	788	777	761	737	706	566				

of dryness. In moist situations, treated material should be used to prevent decay. Tests have shown that creosote in itself does not weaken wood perceptibly, although the strength of wood can be influenced by carelessly performed treating processes. These strength data are of particular value to the architect. They have been reworked, for example, into tables showing the permissible maximum spans for joists and rafters of different sizes in the different species. These are obtainable from the National Lumber Manufacturers' Association, Transportation Building, Washington. Careful use of these authentic stress values in the designing of buildings leads to real economies, because the maximum utility value of lumber is realized.

Frequently factors other than the stress value listed in Tables 1 and 2 have an important bearing on the practicability of a given species for a given use. The degree to which it will "work" when in place, the ease with which it can be worked with tools and can be glued, its hardness, and its nail-holding strength, frequently determine the suitability of a wood for a given purpose. Wood from this angle is presented in Table 3. These observations are based on actual tests in the laboratory and the judgment of men long experienced in the use of wood. Attention is particularly called to the footnotes attached to Table 3 as an aid in the proper interpretation of the table. The Roman numerals do not necessarily indicate degrees of difference, and the values should be used with judgment. A sample piece full of knots, for instance, will not work as well as a clear specimen of any species listed.

TABLE 3

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	(1) Specific Gravity	(1) Volumetric Shrinkage Green to Oven Dry	(2) Side Hardness	(3) Ability to Stay in Place	(4) Workability	(5) Nail Holding Ability	(6) Ease With Which Wood Can Be Glued
SOFTWOODS							
Cedar, Port Orford	.41	10.7	700	II	I	IV	II
Cedar, western red	.31	8.1	380	II	I	IV	II
Cedar, white	.29	7.0	340	II	I	IV	II
Cypress	.41	10.7	550	II	II	IV	II
Douglas fir (coast)	.45	12.6	810	II	II	III	I
Fir, balsam	.34	10.8	500	III	III	IV	II
Fir, western white	.35	10.2	460	III	II	IV	I
Hemlock, eastern	.38	10.4	490	IV	III	III	II
Hemlock, west coast	.38	11.6	620	II	II	III	I
Larch, western	.48	13.2	870	IV	II	III	II
Pine, Calif., white	.38	10.0	460	I	I	IV	I
Pine, Idaho white	.39	11.5	420	II	I	IV	I
Pine, loblolly and shortleaf	.50	12.6	860	II	II	III	I
Pine, longleaf	.55	12.3	1020	II	II	III	I
Pine, Norway	.44	11.5	600	II	III	IV	II
Pine, pondosa	.38	10.0	460	I	I	IV	I
Pine, sugar	.36	8.4	460	I	I	IV	I
Pine, white	.36	7.8	470	I	I	IV	I
Redwood	.41	6.3	520	II	I	IV	I
Spruce, red & white	.37	12.0	540	II	II	IV	I
Spruce, Sitka	.34	11.2	530	II	II	IV	I

TABLE 3 (Continued)

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	Specific Gravity	Volumetric Shrinkage Green to Oven Dry	Side Hardness	Ability to Stay in Place	Workability	Nail Holding Ability	Ease With Which Wood Can Be Glued
HARDWOODS							
Ash, white	.52	12.6	1320	I	I	I	III
Aspen	.36	11.1	460	II	II	IV	II
Brasswood	.33	15.8	450	II	I	IV	I
Beech	.54	16.2	1190	III	II	I	V
Birch, yellow	.54	16.8	1320	II	II	I	III
Cherry, black	.47	11.5	1030				
Chestnut	.40	11.6	580	I	I	IV	I
Cottonwood	.37	14.1	480	IV	II	IV	I
Cucumber	.44	13.6	790		II	IV	I
Dogwood	.64	19.9	2530	I	III	I	V
Elm, white	.44	14.4	870	II	III	II	I
Gum, black	.46	13.9	850	IV	III	II	II
Gum, red	.44	15.0	720	III	II	II	I
Hickory, shagbark	.64	16.7		II	III	I	IV
Maple, hard	.56	14.5	1430	II	II	I	III
Maple, soft	.48	12.5	990	II	II	II	V
Oak, red	.56	14.2	1310	III	II	I	III
Oak, white	.60	15.8	1370	II	II	I	I
Sycamore	.46	14.2	810	IV	III	II	II
Walnut, black	.51	11.3	1080	I	II	II	I
Yellow poplar	.37	11.4	450	II	I	IV	I
Mahogany				I	II	II	I

(1) Based on green volume and oven-dry weight.

(2) Side hardness load in pounds required to imbed a ball .444 inches in diameter one-half its diameter in wood.

(3) Represents a gradation from those woods which possess the greatest ability to stay in place under conditions of actual use (Class I) to those species which do not possess that quality to the same extent.

(4) Represents a gradation from those woods that can be worked with comparative ease (Class I) to those which present some difficulties in this respect (Class IV.)

(5) Represents a gradation from those which have the greatest nail holding power but have the greatest tendency to split (which necessitates the use of smaller nails) to those having the least nail holding ability but which are less likely to split.

(6) Woods in Class I are known to be used commercially in glued construction. Class II includes species about which little is known but which are not believed to be difficult to glue. Class III includes woods which are known to need a little more attention in gluing than Class I woods in order to get best results. Class IV includes woods which are known to present real difficulties in gluing. Class V includes those species about which little is known but it is believed they would present some difficulties in view of their similarity to species of known properties.

These are approximate values only.

Commercial Sizes of Lumber. A lack of appreciation of the manufacture of lumber on the part of the layman has been responsible for much questioning as to why the American Standard 1-inch yard board is 25/32 of an inch thick when dressed. The lumber manufacturer sets his saw, for example, to cut logs into boards exactly 1 inch thick. Due to the unavoidable variation in every mechanical operation, however, some pieces may be just under and some just over 1 inch thick. Before these boards are wanted by the consumer, they must be seasoned and usually brought to both uniform size and smooth finish. In these operations of sawing, seasoning, and dressing, 7/32 of an inch of lumber is required. The board originally 1 inch thick is hence 25/32 of an inch thick when it reaches the consumer, seasoned and dressed and ready for use. The seasoning process, however, increases the

strength of wood to such a degree that the wood lost in smoothing the surfaces of a board is compensated for. The dressed board of 25/32 of an inch is therefore as strong as a 1-inch green board, and in addition is smoothly finished, ready for use. The development of standard sizes for commercial lumber is recent, begun in the year 1922 under the direction of the Secretary of Commerce at the instigation of leaders in the lumber industry. Previous to that time the lumber sizes of one association did not necessarily correspond with the sizes of another. Much depended on local conditions. The owners of some mills saw fit to manufacture heavy lumber. Others preferred to manufacture thinner material. Standardization has reconciled these differences, and it is now possible to order and secure lumber manufactured to American Standard sizes from mills in any part of the country. The economies made effective by this standardization of lumber sizes, to the manufacturer, to the distributor, to the architect, and to the consumer, are quickly apparent.

The green or nominal sizes and the dressed sizes of American Standard yard lumber are given in Table 4. The dressed dimensions for structural lumber are ⅜ of an inch less than the nominal sizes for material from 2 to 4 inches in thickness and 7 inches or less in width. For widths of 8 inches or more of lumber 2 to 4 inches thick, and in lumber of all dimensions 5 inches and thicker, the dressed sizes are ½ inch less than nominal. Uniform workings for flooring, siding, ceiling, partition, and dressed and matched material, and standardized patterns for mouldings are both incorporated in the American Standards. The mouldings present good architectural design and are economical to produce. They are known as the "7,000 Series," and catalogs can be obtained on request from local lumbermen or from the National Lumber Manufacturers' Association.

Measurement and Shipping Provisions. Not only do the American Standards for Softwood Lumber cover manufacture, sizes, patterns, and workings as just discussed, and such lumber qualities or grades as will be described later, but they also cover the important features of universally accepted commercial species and nomenclature; uniform methods of description, measurement, and tally; practical shipping provisions; and standard association inspection services. Some of these aspects of the national standards for lumber enter into specification writing and are therefore of direct interest to the architect.

Grades of Yard Lumber. The untold value of our timber resources lies not alone in their vastness and the fact that they can be and are being renewed, but in the quality and the great variety of different species of trees. There are, in fact, 1,177 different known trees making up our forests. Of these 480 grow to merchantable size. Many produce lumber of similar characteristics, quality, or utility value,

TABLE 4

AMERICAN STANDARD LUMBER SIZES

(The thicknesses for any one item apply to all widths for that item, and the widths for any one item to all thicknesses for that item.)

Product	Rough Green Sizes (Board Measure)		Dressed Dimensions		
	Thickness	Width	Thickness		Width (Face Width Worked)
			Standard Yard	Standard Industrial	
	Inches	*Inches*	*Inches*	*Inches*	*Inches*
Finish	..	3	5/16	..	2 5/8
	..	4	7/16	..	3 1/2
	..	5	9/16	..	4 1/2
	..	6	11/16	..	5 1/2
	1	7	25/32	26/32	6 1/2
	1 1/4	8	1 1/16	..	7 1/4
	1 1/2	9	1 5/16	..	8 1/4
	1 3/4	10	1 7/16	..	9 1/4
	2	11	1 5/8	1 6/8	10 1/4
	2 1/2	12	2 1/8	..	11 1/4
	3	..	2 5/8	..	..
Common boards and strips	1	3	25/32	26/32	2 5/8
	1 1/4	4	1 1/16	..	3 5/8
	1 1/2	5	1 5/16	..	4 5/8
	..	6	..	..	5 5/8
	..	7	..	..	6 5/8
	..	8	..	..	7 1/2
	..	9	..	..	8 1/2
	..	10	..	..	9 1/2
	..	11	..	..	10 1/2
	..	12	..	..	11 1/2
Dimension and joists	2	2	1 5/8	1 6/8	1 5/8
	2 1/2	4	2 1/8	..	3 5/8
	3	6	2 5/8	..	5 5/8
	4	8	3 5/8	..	7 1/2
	Over 4	10	Off 3/8	..	9 1/2
	..	12	..	..	11 1/2
Flooring	..	2	5/16	..	1 1/2
	..	3	7/16	..	2 3/8
	..	4	9/16	..	3 1/4
	1	5	25/32	..	4 1/4
	1 1/4	6	1 1/16	..	5 3/16
	1 1/2	..	1 5/16	..	..
Bevel siding	..	4	7/16 (Min.) x 3/16	..	3 1/2
	..	5	10/16 x 3/16	..	4 1/2
	..	6	..	..	5 1/2
Rustic and drop siding (shiplapped)	..	4	9/16	..	3 1/8
	..	5	3/4	..	4 1/8
	..	6	..	..	5 1/16
	..	8	..	..	6 7/8
Rustic and drop siding (D. & M.)	..	4	19/16	..	3 1/4
	..	5	3/4	..	4 1/4
	..	6	..	..	5 3/16
	..	8	..	..	7
Ceiling	..	3	5/16	..	2 3/8
	..	4	7/16	..	3 1/4
	..	5	9/16	..	4 1/4
	..	6	11/16	..	5 3/16
Partition	..	3	3/4	..	2 3/8
	..	4	..	..	3 1/4
	..	5	..	..	4 1/4
	..	6	..	..	5 3/16
Shiplap	1	4	25/32	..	3 1/8
	..	6	..	..	5 1/8
	..	8	..	..	7 1/8
	..	10	..	..	9 1/8
	..	12	..	..	11 1/8
Dressed and matched	1	4	25/32	..	3 1/4
	1 1/4	6	1 1/16	..	5 1/4
	1 1/2	8	1 5/16	..	7 1/4
	..	10	..	..	9 1/4
	..	12	..	..	11 1/4

bringing about the recognition in commerce of 60 or more individual species or groups of different species of hardwoods, and 30 or more individual species or groups of similar species of softwoods. This gives the architect and the consumer of lumber a wide variety from which to select the woods most suitable for his needs. The very fact, however, that there are so many quality woods available, each varying in one or more properties from the others, made the standardization of grades of softwood yard lumber more difficult than the unification of yard lumber sizes or any of the other aspects of lumber standardization so far described. In fact, variations in methods of manufacture, in inherent quality, and in prevailing types of defects, give rise to differences in general utility value among the soft-

TABLE 5

SYNOPSIS OF AMERICAN STANDARD LUMBER BASIC GRADES FOR YARD LUMBER

Grade	*Quality*	*Chief Uses*
A Select	Practically free from defects.	Highest type of natural finished interior trim and woodwork, of flooring in some woods, of ceiling and partition, and of exterior siding.
B Select	Small defects, principally knots or small pitch pockets, and slight manufacturing defects.	Excellent quality of natural finished interior trim and woodwork, and the highest type in many woods; excellent flooring and for other interior uses, and for painted exterior trim and siding.
C Select	Slightly more and slightly larger defects than in B Select, not exceeding medium in size or character, with some manufacturing and seasoning defects, all coverable by paint.	Best quality painted interior trim and woodwork, exterior uses, and often serviceable for natural finished interior trim.
D Select	More and larger defects than in C Select; none causing waste or detracting from a finished appearance when pointed.	Universal grade for those uses always painted, and particularly where only one side and two edges of the piece show.
No. 1 Common	Tight knotted, sound stock with size of defects and blemishes limited, not necessarily as perfectly manufactured as Select lumber, but always usable without waste.	Suitable for the highest type of general utility and construction, both in boards and dimension; often suitable for painted exterior trim, and in products such as flooring, ceiling, and siding for interior uses not required to be of highest quality.
No. 2 Common	Allows somewhat larger and coarser defects than No. 1 Common, mostly tight with occasional loose knots and decay discolorations, and some imperfections in manufacture, and usable without waste.	Suitable for general utility and construction purposes both in boards and dimension; and the most suitable grade for construction not of the highest type, or of a temporary character.
No. 3 Common	Allows larger and coarser defects than No. 2 Common, and occasional knot holes, decay and wane. Permits some waste in its use.	Suitable for temporary construction, many parts of small buildings, and in some woods for sheathing and similar purposes in the best construction.
No. 4 Common	Admits the coarsest defects such as decay, holes, and wane, and permits waste in its use.	Suitable for many uses but not of particular interest to the architect.
No. 5 Common	Must hold together in ordinary handling	

woods which, it was found, could not be completely reconciled by standardization.

Prior to lumber standardization, manufacturers sorted lumber according to their own ideas and markets. Often the definitions and terminology of grades were indefinite and unlike. From this rather chaotic state, groups of manufacturers producing a limited number of woods compiled and published association grading rules for their own woods. This was the first step toward national standardization and represented great improvement over conditions obtaining early in the history of the lumber industry. With these association grading rules as a guide in the lumber standardization movement, which was instituted and carried on by all branches of the industry itself under the encouragement and auspices of the Secretary of Commerce and with the aid of the Department of Agriculture, basic grade classifications applicable to all softwoods cut into yard lumber and factory lumber were formulated. Association grading rules have now been brought into general conformity with these basic classifications, so that all commercially important softwoods are now available in American Standard grades.

Specifying the Correct Grade. Along with grades of structural lumber described here, yard lumber grades are of vital interest to the architect. Yard grades are based on the number, size, and character of the defects permissible in each piece. These are determined by the requirements of the majority of uses for each grade. The use-value of different woods is dependent upon the respective physical and mechanical properties and methods of manufacture, prevailing types of defects, etc., of the different woods. Consequently, in making selection of the proper wood or woods and the most suitable quality for a given use, the architect must take both the quality of the grade and the utility value of the wood into consideration. The foregoing discussion and tabular data are designed to supply information on the comparative utility values of the different woods. As a guide to the architect in selecting the general grade quality of material applicable to his needs, Table 5 has been prepared. It is an amplification of the American Standard basic grade classifications for yard lumber and describes in general terms the character of each yard grade of the commercially important softwoods and some of its chief uses.

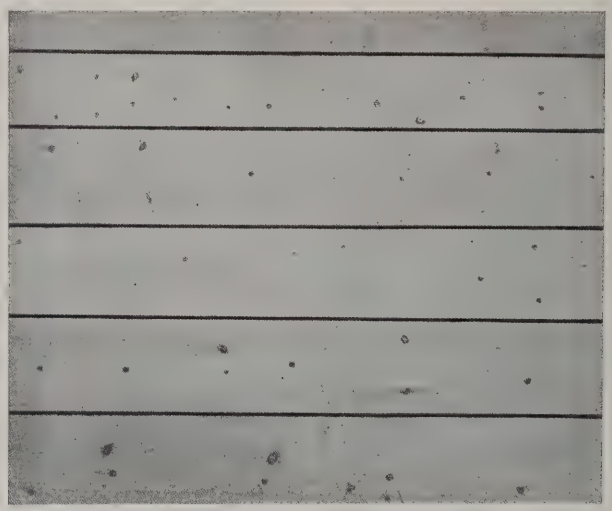
Grades of Structural Lumber. The American Standards also incorporate basic provisions for the selection and inspection of softwood dimensions and timbers where working stresses are required. The grading of such material is different from the grading of yard lumber, in that not only are the number, form, and size of defects considered but also their location with respect to the different faces and ends of the pieces. In addition, the comparative density of the material is important. The influence of defects gives rise to two basic structural grades,—Select and Common. More serious limitations are placed on defects permissible in the former than in the latter. When, however, the factor of density is added, two more grades are made possible, one of which, besides being of Select material, is dense, and the other, besides being of Common material, can likewise be dense. The Standards now provide for three of these grades,—Dense Select, Select, and Common. Dense Select material is the highest grade. It must average either on one end or the other, six rings of annual growth per inch, and in addition one-third or more summerwood. If 50 per cent is summerwood, 5 rings per inch are sufficient. It is found only in southern pine or Douglas fir, and is requisite for uses where great strength

and stiffness are required, such as for bridge timbers, beams and posts in heavy timber mill constructed buildings, etc. The second grade is Select. It must have the rings of the Dense grade but not the summerwood. It is suitable for a large number of general construction purposes, and is available in all softwoods producing structural material. The other American Structural grade is Common and is not selected for either number of rings per inch or per cent of summerwood. It is suitable for a great many structural uses where strength is a consideration but not a prime requisite. It is also available in all structural woods. The density rule of rings per inch and percentage of summerwood may also be applied to material otherwise of Common quality, giving rise to a grade of Dense Common.

The importance of the effect of certain defects and their location in the piece varies, however, according to the character of the use. The limitations with regard to permissible defects are somewhat different, therefore, in material used as joists or planks, as beams or stringers, or as posts or timbers. These different use requirements are likewise recognized in the American Standards, so that in each of the three Standard grades just mentioned there are three so-called use-grades of the character just described. The employment by the architect and lumber specifier of the proper structural grade, therefore, requires judgment.

Advisory and Consulting Service. Progressive lumber manufacturers throughout the country have realized for some time that if lumber is to render its maximum service, they must make available to the architect who specifies lumber, technical advice and consulting service of a staff of engineers and specialists familiar not only with the problems of the users of lumber but also versed in the properties and uses of lumber in their various special fields. During the past year such a group of trained men has been brought together. An expert is stationed in each region to discuss the architect's problems, to advise in regard to the kind and size of lumber, the sources of good lumber, and the proper way to specify and procure it.

B and Better



No. 1 Common

No. 2 Common

No. 3 Common

Some Typical Grades of Yard Lumber

THE UNIVERSITY OF DENVER STADIUM

W. E. & A. A. FISHER, ARCHITECT

GAVIN HADDEN, CONSULTING ENGINEER

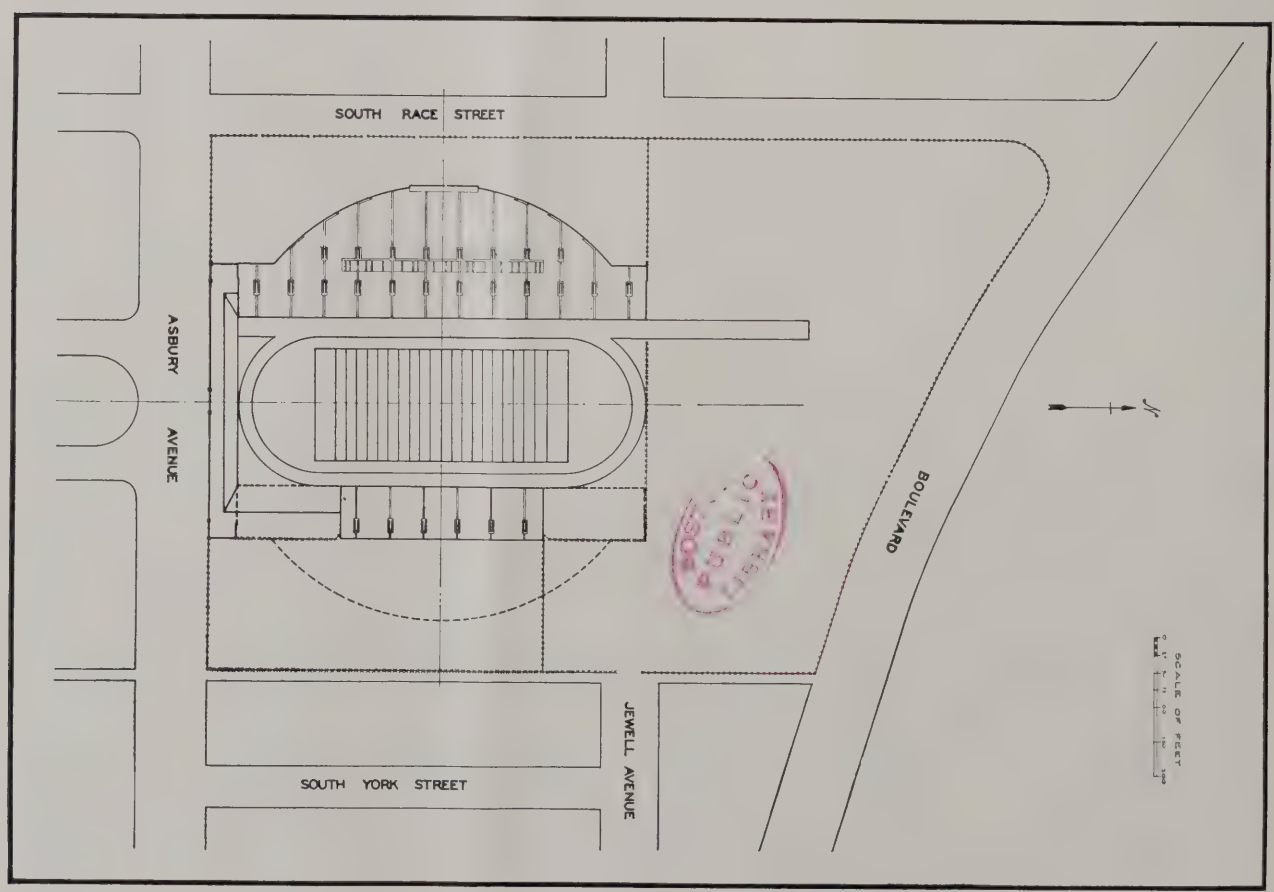
THE University of Denver Stadium, shown in the accompanying illustrations, has at present about 31,000 permanent seats for football and track games. The structure is built in two parts, located on opposite sides of the arena, and the completed west side alone seats about 25,000 spectators. With the completion of the east side, therefore, the capacity will be increased to about 50,000 seats, and still further increases may readily be made, temporarily or otherwise, at the ends of the arena.

The design of this structure shows the modern tendency to differ widely from such ancient examples as the Roman Colosseum or the Panathenaic Stadium in Athens to meet more adequately the conditions and requirements of the modern games for which it is principally used. Not long ago there was a definite architectural prejudice against the division of a monumental structure of this kind into two separate parts without making physical and structural connection at one end or at both ends of the arena. Such connections were regarded as necessary for the attainment of unity in design, and it is only recently, comparatively speaking, that the realization has been reached that the field or arena itself is properly the central feature of the design. The arena itself, with its playing field and running track, forms a connecting link between the two structures, just as surely as the nave of a cathedral may form the connecting link between two lofty disconnected spires. Still further departure from ancient precedent is found in the form of the completed part of this structure. Spectators at football games, for whom this structure is primarily intended, generally desire seats located as close as possible to the 50-yard line of the gridiron and as close as possible to the center of the field. This has resulted in principles which determined previously the design of such structures as the Cornell Crescent at Ithaca, the Brown Stadium in Providence, and also more recently the Dyche Stadium at Evanston, and the Municipal Stadium at Asbury Park. The exterior wall, which in plan forms a circular curve centered

Photos. Louis H. Dreyer

View of the Stadium from Asbury Avenue

VIEW SHOWING SIMPLICITY OF CONSTRUCTION



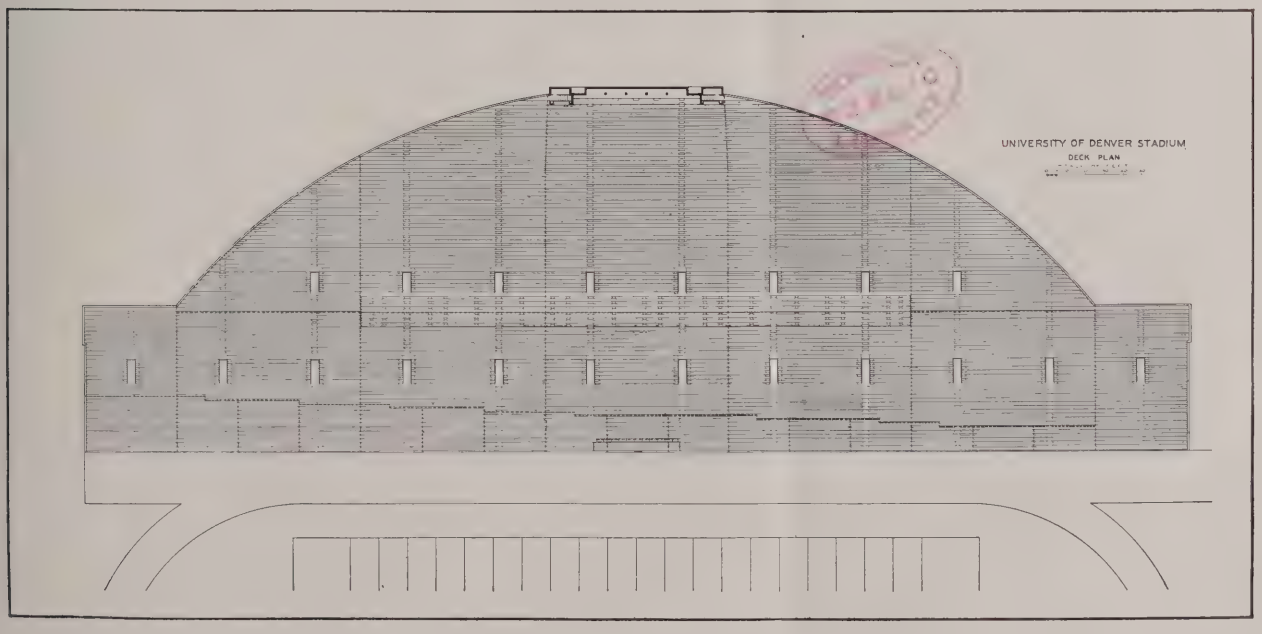
GENERAL PLAN, DOTTED LINES SHOW POSSIBILITY OF ENLARGEMENT

Entrance to Portals

Gate and Entrance

on the middle of the football field, terminates the rising tiers of seats and thus forms a curved skyline which is the most distinctive feature of the arena, particularly well suited to the use of reinforced concrete, of which the structure is built. Still further distinction is added to the skyline curve in its exterior elevation by the continuous succession of ascending and descending arches piercing the outside wall.

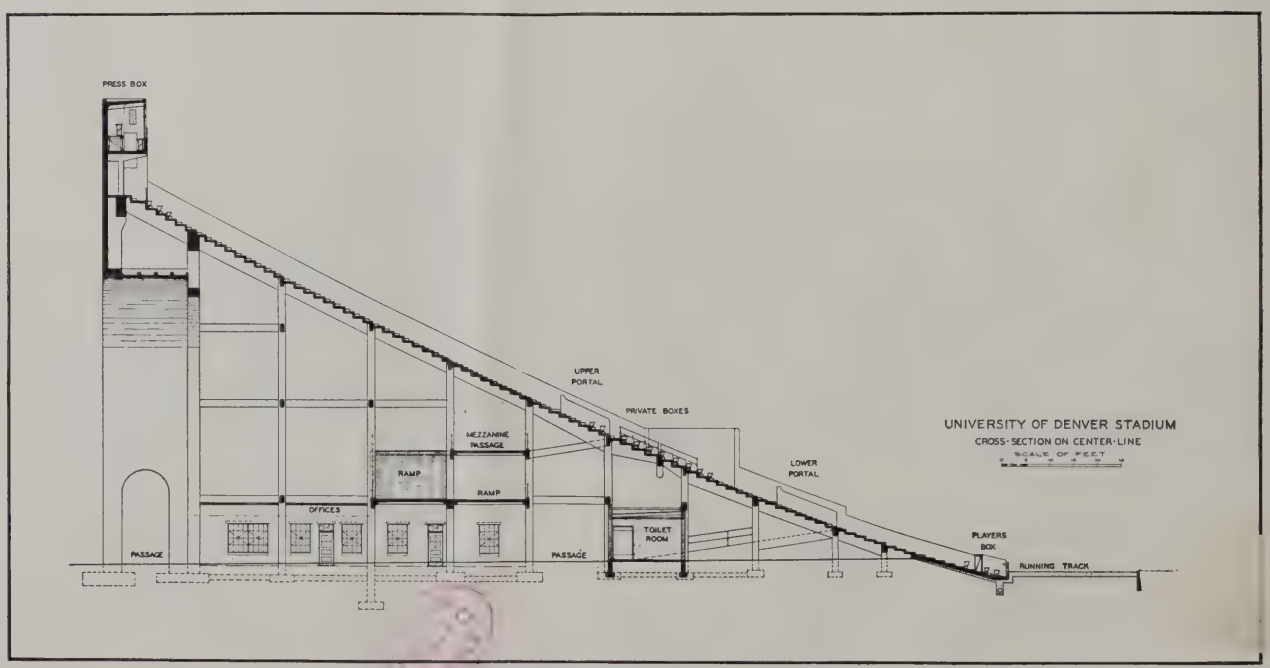
An interesting lesson has been learned from recent use of the stadium, which serves still further to prove the soundness of this design. The private boxes, as shown clearly in the plan, are located in two longitudinal rows, part way up the stand, extending approximately from goal line to goal line. There has been so much demand for the centrally located boxes, and so little demand for those nearer the



Plan of Stadium; Press Box at Top; Private Boxes in Center

Space Under Stands, Used for Offices, Team Rooms and Service

ends, that it indicates definitely that the same general principles might well be followed in box location as in the location of the ordinary seats, placing a proportionally greater number of boxes opposite the central part of the field. The drawing of the cross-section of the stadium shows that the first row of seats is close to the level of the track and field. This enables the spectators to obtain a good view of all runners on the running track, even though this first row of seats is located close to the boundary of the track; this arrangement of seats at the same time reduces the distance of the average and maximum view at football games. The running track itself was designed according to the best practice, developed and improved from experience elsewhere, and the excellence of the results was attested by the



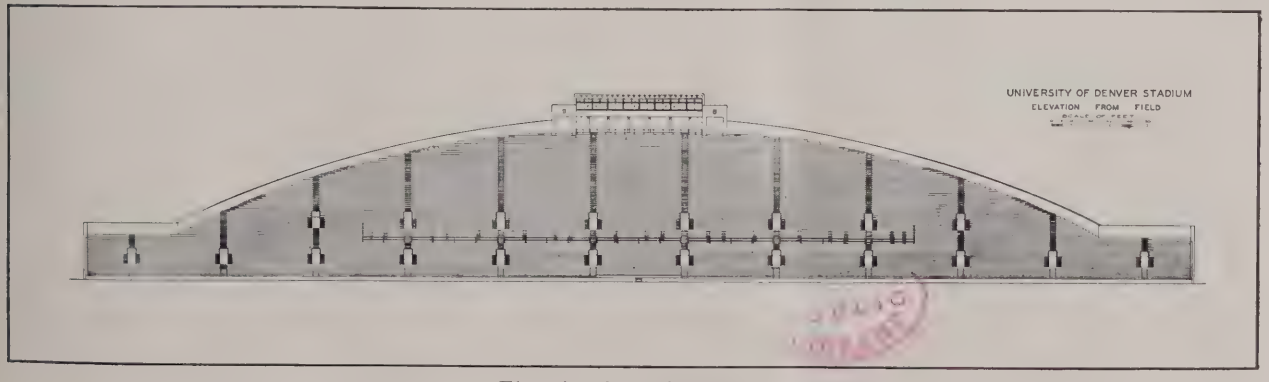
Cross-Section on Center Line of Stadium

The Large Protected Press Box

records attained at the very first of the track meets.

The entrances and exits are located in two longitudinal rows at intermediate elevations on the deck. The upper portals are fewer in number than the lower and serve only the upper part of the deck. As all except one of the lower portals are reached by ramps extending up from the ground under the structure, nearly all the spectators can go to and from their seats with comparatively little exertion, the only steps being those located in the aisles in the deck. The circulation facilities have been carefully designed to provide safety, comfort and convenience, and the entire stadium can be emptied of a capacity crowd in a few minutes without there being undue congestion.

Other interesting features of this structure, some of which are shown in the illustrations, are the press box, with its many conveniences; the players' boxes; the expansion joints; the drainage system; and the extensive use for interior rooms which has already been made of a large part of the space under the seating deck. In addition to the space required for the ramps and passages for the circulation of spectators, the completed part of the structure houses spectators' toilets, rooms for players, a large lounge room, coaches' and trainers' rooms, a laundry and dry room, a caretaker's room, administration offices, and a dining room and kitchen for training tables. One important use of the stadium is for civic events, some of which may require only a small stage or arena, and the form of the structure makes it also particularly advantageous for such purposes, since a majority of the seats are concentrated within a small distance of one spot.



Elevation from the Field

VIEW OF THE STADIUM FROM THE FIELD

VIEW IN A ROOM UNDER STADIUM SEATS

EQUIPMENT OF THE SMALL HOUSE

BY
URBAN F. PEACOCK
OF PEACOCK & FRANK, ARCHITECTS

DUE to changed economic conditions, planning the average house today presents to the architect a problem entirely different from what it did a generation ago. Today the architect's responsibility is not limited to supplying artistic design, style or appearance; these must be provided, of course, but along with them he must consider the increased demand for modern facilities for health and comfort. Nor is it enough that the architect provide only such of these facilities as are demanded by his client. He must also anticipate the needs of his client and tactfully call attention to them, all of which is strictly in keeping with the modern demand for service and the trend of modern practice.

The growing desire for comfort and efficiency has been more pronounced with reference to the planning of the medium priced house than with the larger and more expensive residence. The reasons underlying this demand are obviously brought about by the rise and rapid increase in the number of a class of highly specialized technical workers,—the doctor, the lawyer, the professor, the engineer, the department head, the junior executive, etc.,—in a word, the great class of men who are trained but who have to work at small salaries during the earlier years of their careers. They belong to the class whose incomes range from $5,000 to $15,000 a year, a group which, income tax returns show, has grown enormously in the last decade. The medium priced home represents, usually, the life-long ideal of these people. It has been the goal of the man and his wife, usually a well bred woman, since the days when the salary had to be carefully budgeted, to make it cover the monthly expenditures. Enduring the discomforts of living in quarters in a district where rents were commensurate with the size of the pay check, a man of this type and his wife have had the thought of home constantly before them. "When we build a home of our own" has been a daily phrase in their household. All of their dreams have centered about it. They have worked and economized for years in order to achieve it. Happiness, to these people, is symbolized by "a home of our own."

The architect should remember, in dealing with this type of clients, that he is not dealing primarily with the man. He is dealing with the man and his wife,—and the wife is going to have a great deal to say in the matter. Naturally, planning a home for them entails more than style or design. They want the artistic, of course, but that is not all; first of all they want *comfort*. During the years of discomfort which the wife has undergone in rented houses, she has formulated a very definite idea of what a home of her own was to be when she and her husband could afford to build it. She has subscribed to magazines which deal with home building, and from them she has learned a great deal about style and various types of architecture, home equipment and planning. In her mind's eye she has already built the home about which she now consults the architect, and she demands that he give her something which agrees with it. In order to do this, the architect must attack the problem of home planning from the wife's point of view. In other words, he must begin with her three major considerations: comfort, style and efficiency. The arrangement of all the rooms, in fact, must be made to conform to her artistic taste and her demand for modern convenience.

The plan of the house in general must be such that it saves her or her servants as many steps as

Refrigerator and Kitchen Cabinet Combined

Range in a Well Appointed Tile Kitchen

possible. The kitchen must be conveniently located with reference to both front and rear entrances; the bathrooms must be convenient to the bedrooms. There must be a lavatory on the first floor, located so that the children can get to it and to their play room without going through the main rooms of the house when they come in from out of doors. There will be no left-handed sink in her kitchen; interior doors will swing the right way; the cupboards will be located in the most convenient places; there will be an incinerator, and the modern electric refrigerator will conform to her desire to reduce the number of necessary steps to a minimum. There must be a sufficient number of base plugs in the proper places for floor lamps, vacuum cleaner, iron, toaster and other electrical appliances. Ornate mouldings which catch dust and are difficult to clean must go into the discard. Interior door sills are no longer desired, because of the hindrance they present to cleaning, and the danger they represent in tripping. Modern heating cabinets skillfully concealed in the paneling or beneath windows and cupboards may replace the ugly, old radiators, for the modern woman has read about them and wants them.

She demands proper ventilation and frequently is familiar with the various devices that have been created to improve it, particularly in the kitchen and in the sleeping rooms. Women, particularly those who read the current magazines, have become fairly well versed in knowledge of modern home management, and their education in this direction is reflected very noticeably in architecture. She knows about insulating the house against the winter cold. The heating plant is not a mystery to her; she knows that she can heat economically without the shoveling of coal. Thus it is the business of the architect to be well posted on the devices which have been designed to make the house more comfortable, more efficient and more liveable. Architects must know what all these devices are, what they provide, and what it costs to install them, and they must be able to tell their clients in detail just what they will accomplish; and while it is not the duty or even the function of the architect to attempt to promote the installation of these devices, it is his business to give the client what he or she wishes, and it is his duty for the sake of his profession to be able to assist the client in properly planning the house and to safeguard him or her against overlooking things which the architect knows will be wanted when the new house is completed and occupied.

Such a house must be equipped with all modern devices, both those in general use today and those which will be generally demanded tomorrow. Of all the defects or inconveniences which may creep into a finished modern house, probably the worst is improper heating. Defective heating may be brought about by lack of radiation, not enough boiler capacity, improper distribution of radiation, or lack of heat control. The steady development of the principle of heat control has brought this country to a point where almost everyone has heard of automatic heat regulation and the assurance it gives of health and comfort. A few years ago the average man or woman planning a medium priced house would never have thought of asking for automatic heating control. In the last four or five years particularly, it has shown a remarkable growth. People have come to recognize the regulator as a device which will render comfort, and in climates where sharp temperature changes are frequent, people understand that the uniform temperature assured through automatic heat regulation is a real protection to health.

Many people have heard of automatic heat regulation but are not entirely familiar with its principles. They do not understand that even though heat regulation is not immediately contemplated, the wiring at least should be installed at the time the house is wired for electricity, thus saving bother and worry at some later date. The architect must be able to explain in detail just how an automatic heat regulator can be installed in the house. The family may have one or two small children for whose health the mother is very much concerned. Dr. C.-E. A. Winslow, Professor of Public Health, Yale University, has shown that childhood illnesses and the incidence of contagious diseases are closely correlated with room temperatures. In an extensive study of the subject he found that children kept in rooms in which the temperature was above 68° Fahr. showed a much greater susceptibility to disease than did children kept in rooms where the temperature was maintained at 66° or 68°. The results of research have been widely published in women's magazines, and a woman of the type being considered here is probably familiar with them.

Devices which have to do with refrigeration, control of humidity, ventilation, heat regulation, etc., are coming into general demand among modern home builders. The last five years have seen this demand double, treble and quadruple. The architect, therefore, who is keeping abreast of the progress of his profession, must familiarize himself with the best and latest that is being offered, for their importance in the home is coming to be looked upon as fully as great as the importance of design or decoration. Comfort and health are assuming importance in daily life. They are becoming major considerations in home planning. The architect, therefore, must consider them and place upon them the emphasis which they are receiving in the minds of this generation. Economic conditions have given rise to higher standards of living. Demands must be catered to, and architects must know and meet them.

OFFICE PRACTICE

THE ARCHITECT'S BUDGET

AN ADDRESS BY

EDWIN BERGSTROM

THE SIXTY-FIRST CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS, HELD IN ST. LOUIS, MAY 16-18, 1928

ARCHITECTURE is a busy profession. Without doubt there enter into it more of business and detail of business administration than enter into any other profession. It is not a true profession in the sense that the other fine arts are professions. The musician, painter and the sculptor create with their own hands their finished art, but the architect would make a sorry showing if he should build his dreams. Of all professions, his alone must depend upon others to give form and substance to his art. Architecture is further differentiated from the other professions. The architect creates his art to satisfy a definite need; the sculptor and painter to satisfy their own imaginations. There must be definite need for his creation before the architect can begin his work of art, and simultaneously there must be furnished a sum of money, with which and within which the architect must work.

Architecture, we know, is a collaborative profession, a coördination of efforts to create a work of art to fulfill a definite need within a definite cost. The mind of the architect must interpret the need from another mind, apply it to his imagination, translate the concept to other minds, and direct still other hands to give it form and substance and make it fulfill the need for which, and satisfy him for whom, it was created. Nor is this all. We hear a great deal about the delightful collaboration with the other arts, but no one stresses the less delightful collaboration with the countless laws and ordinances and rules and regulations and codes and municipal authorities. It is trite to reiterate these things, but merely to do so proves how inherent an element of architecture is business.

There are still a few architects who can practice architecture in its simplest terms,—and how delightful that is! But a civilization so complicated as ours, so essentially urban in its thoughts, requires for its comfort, if not for its needs, so many material things that a superman could not be expected to have knowledge of them all. Yet the architect must know and coördinate all these material things and bring about a synchronized collaboration of the trades in order that the work of each will be properly incorporated in his conception.

All this collaboration is expensive. Each collaborator must be compensated and derive a profit for his labor, and the architect, too, must live. Mostly there is little left after the architect has paid his collaborators. To create his art the architect must act as architect, engineer, agent, trustee, supervisor, buyer, collaborator, coördinator, executive, and administrator,—obviously he cannot collect a fee for each function, nor does any fee he receives ever seem to be an adequate fee, in the general run of things

With these myriad responsibilities and duties the architect must conduct a business, no matter how much he desires to suppress that idea. How he conducts it, will be the gauge of his business standing. Generally he gives his time so freely to others that he has little of it left for the intensive study of his own business and its cost. He does not watch his production and other costs with the care that good business demands. He is prodigal of his time and wasteful of his money. Engaged in a business which is notable for its fluctuations and quick upsets in volume, the architect is seldom adequately prepared for reverses and prolonged periods of stagnation. When business is good he must expand and build up an organization; overnight he is compelled to disband it and to economize,—fortunate if he can do this. How often we see the successful architect wearing himself out finding commissions to keep his organization going. He becomes a slave to it,—and finds himself in the anomalous position of working to keep his draftsmen busy and his overhead paid, with nothing left for himself but worry and strain and what fame may come of an artistic success.

Of all professional men, the architect should be most concerned with costs. Usually the architect is more familiar with building costs than he is with the costs of carrying on his profession and creating his art. How many architects know what it really costs them to get to the point where working drawings can be begun or even preliminary sketches made? How many know what working drawings cost, sheet by sheet, job by job? How many know what supervision costs,—supervision adequate to ensure the workmanship and materials to which the owner is entitled? How many know what these costs should really be? With what other costs can they be compared?

As an impractical dreamer, the architect is accepted by the business world; as a business man to whom it would entrust the spending of its money, he has not the entire confidence of that world.

Standardization of architecture is an abomination; standardization of procedure and accounting of the business of architecture is very helpful to success. The Institute has not developed a standard form of accounting whereby an architect may ascertain by actual comparison with other architects what true

costs should be. Architects in the United States, in the aggregate, are receiving fees of not less than $80,000,000 per year. I have not the slightest doubt that more than 10 per cent of that sum is wasted annually by the architect in his own offices through neglect and failure to apply sound business methods.

Orderliness in design is axiomatic with the architect; orderliness in his business and in his time is not so fixed a virtue. The artist points thumbs down on schedules and budgets and anything regular or regulated, yet these things are essential to good business. They are necessary to conserve time; they are imperative if we would not waste our money. Our most limited and most precious asset is time. To conserve it is a duty we owe to ourselves and to our families. Our business day should be organized and every hour of it scheduled. Each day we have things to do. We should list them in the order of their importance, with the most important at the top, and then tackle and do each of them in turn and in that order. We must work against time. We should set aside each day so much time for the drafting room; so much for specifications, for accounting; so much for supervision; so much for conferences and callers; for correspondence; for reading on architecture, construction and the allied arts; and, lastly but most important, for constructive thinking about our business. So far as possible, we should fix positive and regular hours, especially for our conferences, calls and correspondence and our thinking. We should make those hours the same for each day. Regularity and regular hours must be acquired, no matter how monotonous or distasteful it may be to do so. That you can be found in your office each day at the same time for conferences, calls and callers is a sound business asset; it gives you a business standing, and you have created an invaluable credit. Do not let one period overlap the other, nor let callers disturb you except within the hours you have set for conferences. Keep telephones away as well, if you have a tactful secretary. Arrange conferences to fit your schedule of time; you will be surprised how this can be done without losing the commission. Your time may be as valuable as your client's.

I repeat,—conserve your time; schedule your hours exactly. Begin this when you begin your practice, when it seems unimportant to do so. The habit established in the lean years will be worth innumerable dollars when you become busy, and of inestimable value to your health and happiness. You will be surprised how much more quickly your decisions will be given; how much more concentrated will be your thinking; how much more time you have for the amenities of life and for your family, if you have found and use the secret of conserving your time and making it work for you. Above all, do not let anything persuade you to give up the hour of constructive thinking about your business. Take that hour early in the day if you can, when you are fresh. It is the most necessary hour of the day to you! Do nothing but think; if you have no very definite problem, think just the same. Let nothing interrupt you.

Budgeting our time is perhaps the most important thing we can do to ensure our business success. Budgeting our finances is the next most important thing to do. Once you have learned to conserve your time, and have acquired the habit of regulated and regular thinking, the budgeting of your finances will come naturally and inevitably. The budget is the control, and the means of lower costs in producing your drawings and documents. Men work for money and for glory. Money means profits, and profits are the reasons for business. I do not speak of profits in the pure accounting sense. Profits can be ensured only by insisting that cash outgo always shall be less than cash income. Business is conducted at present on a monthly basis; if your total expenditures have been less than your cash income, month by month, your business has made a profit. If there is no profit, you run the risk of financial embarrassment, loss and failure. The budget should control the distribution of all money you receive into your business. If you hold within that budget, it ensures cash profits.

To make your financial budget, you must first know costs. To fix the price which you should charge for your services, you must know costs. To know costs, you must first determine expenses.

The architect should fix a salary for himself, as a fundamental element of expenses. Salaries are for the expenses of daily living; profits for investment and surplus. Salaries should be considered as income; profits may be considered as capital. Salaries should be paid regularly month by month; profits must be deducted in cash from each payment received by the architect before any part of that payment is used for any other purpose. Profits are illusive; if not deducted first, they have a way of disappearing altogether. It is fundamental to set aside profits first. Profits should be banked separately from other funds, as savings. One-half of the profits should be considered as business surplus and be kept in the business and invested in first class securities. One-half may be considered as dividends and invested in securities or real estate or such other forms of investment as may please you. Income derived from the investment of surplus should be added to surplus; income from dividends should be put back into capital, but it may be added to salary.

Costs are direct expenses plus distributed expenses. Expenses are direct when they can be definitely identified as having been incurred solely for any item of costs; they are distributed expenses when they cannot be definitely identified as a proper charge against any single item of costs. An expense should be considered as a distributed expense only when the cost of determining the direct charge would be greater than would be the margin of error if the expense were arbitrarily segregated into parts and each part made a direct charge to the item. Expenses should be distributed monthly. Distributed expense is ordinarily called "overhead."

Costs in the business of architecture fall into five

major divisions: (1) Development Cost, incurred prior to the time when the contract between the owner and architect is executed; (2) Production Cost, incurred to produce the preliminary sketches, working drawings, specifications and contract documents; (3) Supervision Cost, incurred in the field during construction; and (4) Administration Cost, incurred for general office expenses. These four become the cost divisions of the budget. Development Costs, Production Costs and Supervision Costs are always direct charges. Administration Costs are always overhead and are distributed to the other three major cost divisions. Each major cost division may also have its own overhead to be distributed within itself. The fifth major division of the budget is Profits. Profits plus Development Cost, plus Production Cost, plus Supervision Cost, plus Administration Cost, equal total business income. Set up the fifth division first in the budget; deduct it from income. What is left of income are costs. This is fundamental.

The next step is to fix these Costs in money. When that is done, if the costs so fixed prove to be greater than the balance you have left of income after deducting Profits, you can do either of two things,—reduce costs or face a loss of profit. A loss of profit will start you on the way to worry, fear and insolvency; to reduce costs may mean lowering the quality of service you render your client. If you lower the quality of your service, your action will affect the standing of the entire profession, affect your own standing, and clearly indicate that a day of reckoning is in the offing. You cannot do either of these things if you would preserve your business integrity, protect your family and ensure your own happiness and that of others dependent upon you. You may lessen, but not forego, the Profits. Therefore, Profits being fixed, if you cannot reduce major costs without lowering quality of service, it is evident that the income is too small and must be raised.

Unalterably this means that for business success in the profession, costs must be accurately determined and should be locally and nationally comparable, and profits must be stable and maintained. Quite plainly, too, it indicates that our present system of fees is unscientific and fundamentally inaccurate. I believe and hope that there will come a time when the Institute will provide in its Standard Documents, complete bookkeeping and budget forms, which if used by the members, will fix a uniform and standard method of setting up our accounts, determining the costs of service, and afford a means of comparing our costs. Inevitably, this will lead to the discarding of the present fee system of charges and the adoption of a method of charging for services which will be fundamentally and economically sound. I believe this would be a true service which the Institute could render to the profession, and that it would go far to eliminate the enormous economic waste and the inequitable charges for services that now obtain in the profession.

How are these four major costs fixed? An accurate estimate for budget purposes cannot be had except through years of experience. The beginner in the practice of architecture at present has no basic data available to permit him to fix these costs at all accurately. This information should be available to him, in some form. If it were, he could start his business and professional life on an economically sound basis. This would be good for the profession at large. The "infant mortality" in our profession, is unduly large. Perhaps it might be reduced by the right economic start. Budget costs should be built up, item by item, into an aggregate total and not vice versa. The more accurate the items, the less the contingency for failure.

Development Costs vary greatly and cannot be standardized. They should include every item of expense chargeable to a project prior to the signing of the contract with the client. Advertising of every form, dues to business organizations, all such kinds of expenses as the architect would not incur if he did not think it would help his business, should be charged to it. Immediately any development expense is incurred looking toward securing a commission, the tentative project should be set up on the books as an account and given an account number. Development expenses incurred in getting that commission should be charged directly to that account so far as practicable, and it should be charged with its share of the development overhead and its proportion of Administration Costs. If the salary of the architect has been properly apportioned between the Development, Supervision, Production and Administration Costs, the Development Cost will be quite accurately determined. I guarantee that every one of you who does not so keep his accounting will be astounded at the cost of procuring commissions. The Development Costs should be charged each month to the tentative project. When the contract for services is signed, the Development Cost heretofore charged to the tentative commission, becomes a direct charge, to become a part of its final cost; otherwise. Development Costs should always be charged off periodically.

I seem to have wandered into accounting, a subject not within the limits of this paper, but one which should be amplified and determined before an accurate budget can be set up.

Production Costs are kept in some form or other by every architect. Usually he figures up his outgo for draftsmen and other tangible items, adds something for overhead, and carries the total as a cost. This can be only approximately right. Production Costs can be closely estimated and fixed for budget purposes. Immediately the contract with the owner is signed, the architect should use his hour of constructive thinking to plan the progress of the work through his office. During that hour and others like it he should plan the drawings to be made and list and give a number to each. He should plan what is to be placed on each drawing. This list of draw-

ings, marked with its estimated number of drafting hours, goes to the drafting room and should not be varied from nor other drawings be made unless they become absolutely essential. Once the sheets are so planned, with the proper cost data at hand, the probable expense of making each sheet can be quite accurately fixed. In no other way can Production Costs be set up with any pretense to accuracy. If this procedure or some other system as accurate is not followed, a budget cannot be set up. To follow this procedure is to set a firm control on drafting, and only thus can drafting room expenses be maintained within the budget estimates. Too much care cannot be exercised by the architect in preparing the Production Costs for the budget.

Supervision Costs are the easiest to estimate. The direct expenses of superintendents, clerks, inspectors, testing, reports, and traveling, are easily determined items. The principal distributed expenses within this major division of cost are the architect's salary and the allocation of the Administration Costs which have been transferred to its Supervision Costs. These are usually estimated too low, principally because the supervision and superintendence furnished by the architect in the usual run of things is woefully inadequate.

Administration Costs are not difficult to determine. All items of Administration Expense are overhead and must be distributed. Therefore they should be kept as few in number as possible. By applying the rule for determining overhead, this is quite easily done, and the distributed charges can be made much smaller in volume than is usually likely to be the case.

Each of the five major items of the budget is thus determined. To go further into their makeup is impossible in this paper, except in one instance. In each of the four major cost divisions, set up a cash reserve. This is the safeguard of your budget. It must be sufficient to cover your errors of judgment in making up the budget, and sufficient to cover the additional expenses which will creep in, in spite of the best made budget. Set aside this cash reserve in each division out of the first income received; if not all, at least its full proportion. I said before, first deduct profits from income,—now I say, deduct cash from the balances in each major cost division and set it aside as a cash reserve in each division. Make this reserve what you think is right, then usually double it. It is better to be right than sorry. Keep these reserves intact as cash to the close of the work so far as you can. Each raid you make on these cash reserves is a barometer of the condition of your costs. If you maintain these reserves intact, your profit is assured. These cash reserves should guarantee money for current operations at all times.

Such is the Architect's Budget,—a budget of his *time* and of his *finances*. In the budget of his time, the hour of constructive thinking is just as important to time as the cash reserve is to finance. Therefore, I repeat, budget your time, budget your finances, set aside your hour of thinking, your profits, your cash reserves. They form a guarantee of your success.

Rendering by Schell Lewis

Perspective of House Designed Within Definite Cost Limits

Lyon & Taylor, Architects

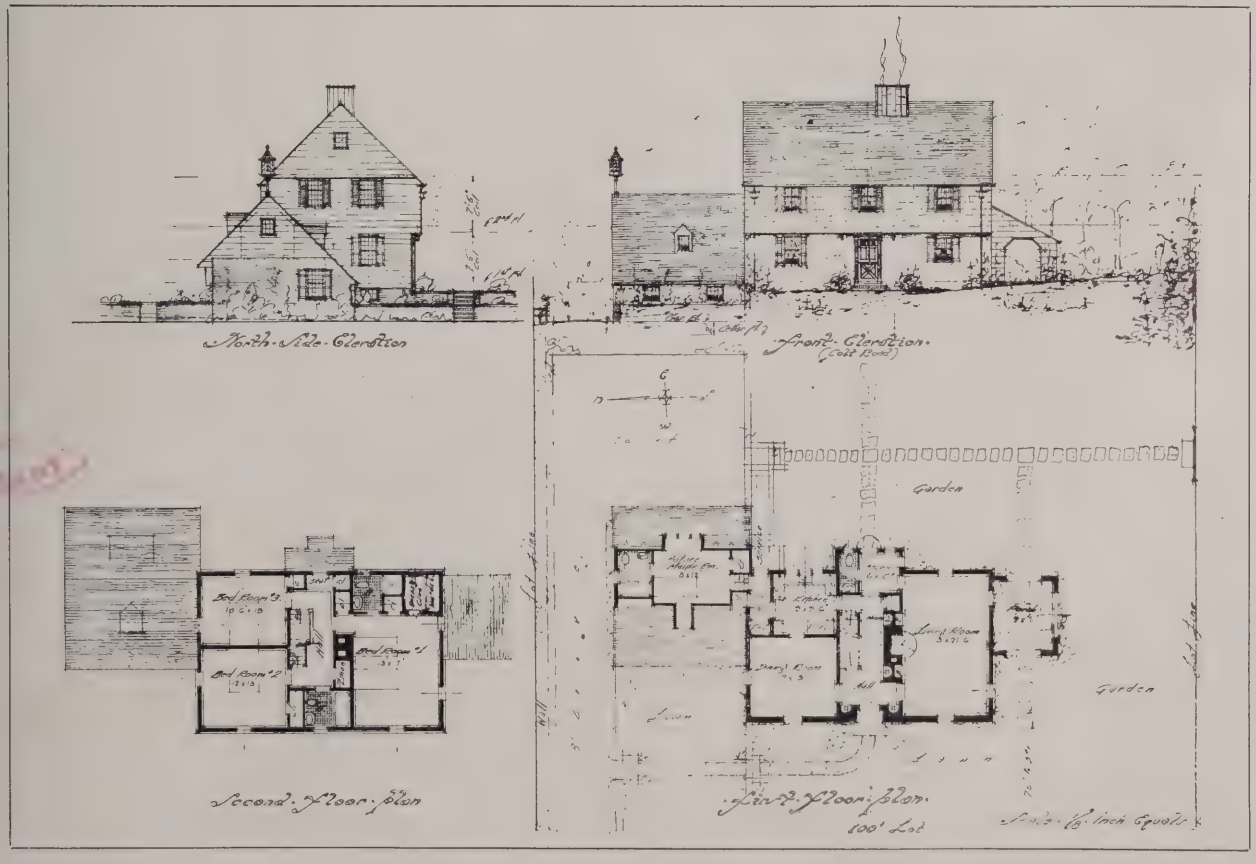
DEVELOPING SKETCH PLANS FOR SMALL HOUSES TO MEET BUDGET REQUIREMENTS

BY
C. STANLEY TAYLOR

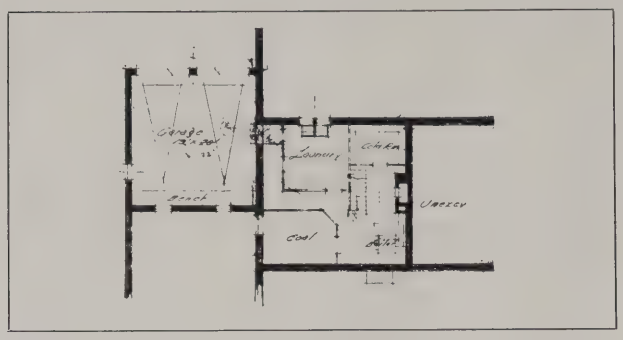
PROBABLY the most difficult problem encountered in normal architectural practice is the development of plans for small houses which can be successfully built within predetermined cost limits. The average client seeking a small house usually has very limited funds available for his purpose and usually has ideals all out of line with his budget limitations. To reconcile the owner's conception of room sizes, plan and arrangements and general architectural design to a rigidly restricted cost limit is the familiar and unwelcomed task of every architect engaged in the domestic architectural field. No matter how far apart the client's tastes and the size of his pocketbook may be, it is distinctly the architect's responsibility to help him secure a house that will meet his needs without plunging him into serious financial difficulties.

Frequently an architect is commissioned to design a small house without any definite cost limit being established by the owner, beyond an admonitory warning that he does not want to spend too much for his home. The owner's main thoughts are centered around matters of style, room sizes and arrangement, and little conveniences he hopes to incorporate in the plans. The owner's wife has dreamed of this new home; her thoughts are mostly of color schemes, architectural features and very practical housekeeping equipment. Costs are in the background until the architect, having faithfully developed sketches which seem to meet his client's wishes, is asked what the house will cost. Then trouble usually starts; the architect is often accused of extravagance or of ignorance of costs; eventually the sketches must be redrawn on a totally new basis with less confidence and good will on both sides, and at a loss to the architect of the good talent and time wasted. The better method is to discuss costs at once and to fully acquaint the owner with the nature of the problem he presents and with whatever necessity there may be for making some concessions in his space requirements or in his cost limits before sketches are undertaken. A frank and complete discussion of this troublesome matter, even before the architect is actually commissioned for the work, is far more advantageous to the owner and architect alike than its neglect until after the client is committed to a program beyond his means, or before the owner's ideas are so fixed with respect to the type of house he desires that he often makes an unwise investment.

The architect who follows this better course soon



Sketch Plans Made to Meet a Definite Budget
R. C. Hunter & Bro., Architects



Cellar Plan of House Shown on Page 137

acquires a reputation for integrity and skill which ultimately will carry him farther in this field than the architect who permits his client to overlook his actual financial limitations for the sake of procuring a house that pleases his fancy without respect to its cost. The architect who completes any project after a long series of struggles and arguments with his client is seldom recommended to others in a like position. He earns a reputation for being an extravagent designer, no matter how much care he has exercised to keep the costs fairly close to the owner's ideas. Even a 5 or 10 per cent overrun may result in serious dissatisfaction on the part of a client who has established at the beginning of the undertaking his actual financial limitations, whether or not the architect is aware of his maximum allowance. A 5 per cent saving within the owner's original budget, on the other hand, will usually leave a lasting favorable impression with the client and will lead him to frequent commendation of the architect's talents and good judgment, and earn for the latter a prestige which may become the foundation for an extensive and steady practice.

Of course, it may be argued that the small house field is never profitable; that it is one which architects enter only as a means of establishing themselves in business; and that a reputation for economical building in this field merely leads to more commissions of this unprofitable type without opening up fields of larger endeavor. It is undoubtedly true that small house architecture for the standard minimum fee is actually burdensome to the architect. A higher fee must be charged in order to pay the cost of well developed plans and adequate supervision. When the fee is made commensurate with the labors involved, domestic architecture in the lower price ranges may pay an adequate income. There are many successful architects whose reputation has been developed entirely around their excellent work in designing small houses. Their practice has grown from this prestige into larger fields, and they have profited in all branches of this practice. Their success has invariably been built upon excellence of design plus intelligent handling of costs.

Aside from the ethics of the situation and the architect's moral obligation to render a complete and intelligent service to his clients who must build within limited budgets, the problem so frequently arises in ordinary practice that some definite means of meeting the situation must be devised. In spite of controversies over the value of cubic foot costs as a guide in estimating the costs of new buildings, no substitute has yet been found that better equips the architect to control the development of his sketch plans within predetermined cost limits. In the New York district, which is probably the highest priced area in the country for home building, many offices have found that they never exceed 60 cents per cubic foot for quality development of small houses embodying sound construction systems and high grade materials in all details. Other offices frequently build within a 50-cent limit, and occasionally some of the very best designers succeed in designing houses that actualy cost from 40 to 45 cents. The difference of a few cents per cubic foot even in a small house rapidly mounts into dollars; nevertheless, the experienced architect soon acquires a definite knowledge of his limitations and can quickly judge the approximate cubic foot cost of a dwelling after outlining its general style and equipment features.

Th first step, therefore, is to translate the owner's idea of space into a probable gross volume for the completed building. It has been established by a number of careful checks that approximately one-half of the gross volume is actually available in the net space devoted to living purposes. Using this as the first guide, therefore, the client may be requested to give the number of rooms he desires and the approximate size of each, together with the ceiling heights for the typical floors. By adding a reasonable amount for closets, hallways and bathrooms, but disregarding basement and attic space and space loss due to the thickness of walls and floors, a net volume of living space may be quickly estimated. Doubling this total would give very quickly the approximate gross cubage of the structure before any plans are attempted. At once the architect is in a position to tell his client that those space requirements will probably come within or will undoubtedly exceed his budget limitations, for the total cost can be checked by multiplying the gross volume by various prices ranging from 40 to 60 cents per cubic foot as the architect may deem suitable for the type of construction and the prevailing local costs. At once the question of reconciling space and cost is presented to the client. A general explanation usually is sufficient to convince the client of the absolute necessity for some adjustment in his requirements. Obviously, the architect who has made no sketches cannot be accused of designing more expensively than some competitors. When the owner realizes that the estimates are based on various cubic foot cost figures, he realizes at once the necessity for modifying his ideas as to quality of finish and equipment and for making concessions in room sizes, arrangements and the general architectural style. This establishes a frame of mind which leads to a satis-

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Rendering by E. A. Bennett

Perspective of Country House Designed to Meet Budget Requirements

Lyon & Taylor, Architects

factory and open discussion of costs throughout the project. No troublesome details enter into the problem at this stage. The whole picture is viewed broadly, and the architect is usually permitted at once to either increase the budget limitations or to prepare sketch plans which will definitely fall within a predetermined cost regardless of the room sizes necessary to achieve this end. If a hopeless situation is encountered, the client may be lost for the moment, but the architect has wasted no time, and in the long run has made a friend who is more than likely to come back when his financial situation is improved or is almost certain to recommend the architect to others; this is far better for the client than if he foolishly undertakes the construction of a house under the guidance of a less ethical designer and pays the severe penalty of considerably exceeding his budget limitations.

At this stage the architect can usually also introduce a discussion of financing methods and may frequently enable an owner to find means of borrowing funds, permitting him to have the house he desires without requiring an initial investment beyond his means and without unduly burdening himself with financing and carrying charges. A sound knowledge of the mortgage market is invaluable to the architect engaged in this work. Assuming that the first discussion has resulted in an approximate agreement as to the size and cost of the finished structure and that the architect has been engaged to prepare sketch plans, he is then committed to a program of carrying out his design work on a basis that will insure his client of a reasonable margin of safety when contract figures are ultimately secured. Again cubic foot cost figures are used as the guide, and the margin of safety is secured by adopting in the early stages a unit which is large enough to permit considerable variation in final details. If the architect is accustomed to building for 50 cents per cubic foot, it is best to compute the maximum volume that can be built within the established budget on a basis of from 53 to 55 cents per cubic foot. The gross volume thus established is then translated in the sketch plans by converting volume to square foot floor areas and using these as a guide for the general dimensions of the floor plan.

Reconciling these volume and area limitations to the development of a successful and workable plan requires the exercise of a great deal of ingenuity and skill. Usually in small house architecture the space problem compells relatively low cost construction in addition to the efficient use of every square inch of floor area. Low cost construction in turn calls for simplicity in plan arrangement and for the adoption of an architectural style which may be consistently followed using low cost materials and stock designs for windows, doors and both exterior and interior trim. It involves the use of carefully planned systems of mechanical equipment, including the concentration of plumbing lines, the careful distribution of radiators, and the selection of an efficient and inexpensive heating plant as well as the careful placement of electrical outlets. A thorough knowledge of building materials is an essential part of the architect's equipment; and equally thorough knowledge of practical construction methods is valuable in preparing drawings and specifications that will permit economical construction without sacrificing quality and

durability. Fortunately, the architect who is a close student of small house design and construction is finding himself constantly assisted in his efforts to provide maximum volume within reasonable cost limits through the introduction of new materials and construction methods. The building field is rapidly being enriched with new products which save space, make possible more rapid construction, or which actually cost less than the usual materials, the use of which has prevailed through custom for many years. Insulating products are being introduced which combine the functions of sheathing and a plaster base in one material. Thin partitions are being developed permitting plastering on both sides of the partition core composed of a single structural material. New composition flooring materials are showing economy over the more expensive tiles for bathrooms and kitchens, and some of these are even taking the place of higher grades of hardwood flooring; stock patterns of windows, doors and standard trim are being so vastly improved in design as to find ready acceptance by architects in place of specially detailed items which not only contribute to the cost of the structure but add to the architect's burden in preparing the drawings and supervising their construction and installation. Marked improvements are being made in heating systems; and quality plumbing fixtures are available which contribute to space saving and to economical installation. The importance of keeping closely in touch with introduction of new materials and new developments cannot be over-estimated for the architect who is to succeed in the small house field.

Unfortunately, the greatest aid in planning small houses within limited budget requirements must be developed by the architect for himself through experience. Cubic foot cost figures are not available through any medium of exchange on a basis which makes them reliable and useful to those not fully familiar with all the circumstances surrounding the particular building upon which they were developed. Undoubtedly the time will come when a standard system of maintaining cubic foot costs will come into general use. This system will not only report the cost based upon a uniform method of computing volume, but will require that the figures be accompanied by a detailed outline of the features of the building and of the construction materials employed, so that others may properly interpret the figure when applying it to other structures of similar or varied nature. For the present, the architect can rely only upon figures developed in his own practice. The adoption and maintenance of a uniform system for figuring cubic foot costs from completed buildings will soon provide the office with data of constantly increasing value.

The basic requirements for a cubic foot cost record system, proved by experience approximately correct, are:

(a) The volume of each building must be computed on a uniform basis. A standard system for figuring volume should provide for a quick method of measuring the volume of footings and foundations and a standard method of adjusting the volume of open porches and minor structures. Footings are usually figured by taking the basement area and multiplying it by 1 foot of depth below the finished basement floor. Open porches are usually figured at from one-third to one-half of their volume if outside the main walls of the building and at their full volume if within the main walls. Bay windows, dormers and other minor architectural features are figured at their full volume in careful computations or are neglected when they do not exceed 3 or 4 per cent of the total volume of the structure. A standard system on this point should be established.

(b) A uniform basis for computing cost is of vital importance. The cost normally should include builder's fee or profit and represent the total cost of construction including all subcontracts, but should be exclusive of architect's fee and of items not directly pertaining to the cost of the building itself, such as grading, planting, driveways, walks and detached garages. If possible, cubic foot cost should invariably be figured on the basis of actual contracts awarded, so as to eliminate the confusion developing through extra costs chargeable to changes made by the owner during the construction period or to unforeseen contingencies which might arise through encountering rock in the foundation work or through delays due to strikes or other extraordinary causes.

(c) The figure given should be accompanied by the date upon which the general contract was awarded, for this usually indicates the prices at which materials and labor are purchased. In a fluctuating market a variation in the date of six months might make a difference of several per cent in a building's cost. Location is of equal importance, unless the architect's practice is entirely confined to a restricted area.

(d) The record should contain a brief description of these major points: total volume; total cost; approximate area of ground floor plan (and if possible the actual size of the ground floor to indicate the approximate perimeter); general style of architecture; construction of exterior walls; mechanical equipment; total number of rooms and baths; and finally, the record should contain a statement as to whether the general quality of construction was (a) low cost, (b) moderate or average cost, or (c) extra quality. Every one of these details is important.

The consistent maintenance of a system of records of this type by many architects engaged in this field would form a basis for a most invaluable exchange of data through the architectural press. Eventually, such an exchange will be accomplished, and when this occurs architects will be able to estimate with increasing accuracy the cost of buildings from their sketch plans and will render improved service to their clients through eliminating the grave danger of exceeding budget limitations, with all the difficulties involved.

MECHANICS' LIENS

BY
CLINTON H. BLAKE, JR.

THE mechanics' lien is an American invention. Formerly in England and in this country there prevailed, and still prevails in England, what is known as the "common law." This is nothing more or less than the law of precedent built up not by statute and the enactment of laws but by the decisions of the courts. When, for example, in the early days of English law, one person trespassed upon another's land, the latter applied to the courts for damages, and the courts, considering the general common sense of the case, declared that the person trespassing must pay damage to the man upon whose land he came, on the theory that the land owner was entitled to the enjoyment of his land without being compelled to allow others to use it. When a similar case next arose, the court followed the precedent thus set down in the previous decision, and so in time this rule of law as to trespass became established. The same course was applied to all other legal questions which arose, and the law was laid down by these precedents, and the law which they established became known as the "common law." In America the common law was originally in force and is still in force in various jurisdictions. Gradually, however, we departed from observance of the common law custom and built up a body of statutory law. The tendency today, as every student of legislation knows, is to cure everything possible by legislation, and an appalling number of statutes are being constantly enacted, accordingly.

One of the fruits of this statutory development was the "mechanics' lien" legislation. Its inception dates back to 1803, when the first mechanics' lien law, apparently, was adopted by the state of Pennsylvania. For some time the mechanics' lien statutes were directed solely to the protection of mechanics and had none of the broader provisions for the protection of workmen, subcontractors and materialmen which now generally characterize them. Gradually the idea of protecting by lien all those who had contributed materially to the enhancement of the real property value involved gained in favor and was adopted generally by the different states. Gradually, also, the scope and extent of the relief afforded by lien laws have been extended, and at practically every legislative session new bills are introduced, the purpose of which is materially to increase the liberality of the lien laws and to extend their benefits to those not heretofore covered by them.

The old idea that the lien statutes were for the protection of the simon pure mechanic only has been almost universally done away with, and the state legislatures are steadily broadening the scope of lien legislation, so as to bring within its benefits practically all those who have, by their labor, contributed to the enhancement of the value or improvement of the real property involved. At the same time it must be understood always that the mechanics' lien is fundamentally a claim against the property, rather than a claim against the owner of the property personally. The theory upon which all of the lien statutes, substantially without exception, proceed is that the property of the owner has been enhanced in value by the labor of those claiming the liens and that therefore it is equitable and proper that the property should be subjected to a lien for the amounts due them.

Owner's Liability. Radical as this legislation is in one sense, it has nevertheless in its development recognized that it would be unfair to expose the owner to a lien claim without strict limitations as to amount and liability. In the better jurisdictions, two main limitations will be found. In the first place, the lien must be predicated upon the consent of the owner, express or implied, that the work be done; in the second place, ordinarily, the total amount recoverable on lien claims will not be allowed to exceed the total unpaid balance due to the contractor at the time the liens are filed. The reasonableness of each of these limitations is obvious. If a lien could be established for work done without the consent of the owner, it would be possible for claimants to do work on his property which he has not wished to have done and then subject the property to a lien for the value of the work. If, also, it were possible to hold the property for all sums due without regard to the unpaid balance of the contract price, the owner would be repeatedly placed in a position where, having paid to the general contractor or other contractors substantially the full value of the improvement made, he finds that his property is subject to liens for a large proportion of the total cost, due to the failure of the contractors to take care of their subcontractors or materialmen.

The provisions of the New York lien law and the decisions of the New York courts on this point are typical of the sounder point of view. The lien law in this connection provides that:

"If labor is performed for, or materials furnished to, a contractor or subcontractor for an improvement, the lien shall not be for a sum greater than the sum earned and unpaid on the contract at the time of filing the notice of lien, and any sum subsequently earned thereon. In no case shall the owner be liable to pay by reason of all liens created pursuant to this article a sum greater than the value or agreed price of the labor and materials remaining unpaid, at the time of filing notices of such liens, except as hereinafter provided."

The New York Court of Appeals, in considering this same point, has decided that:

"The settled construction of the Lien Law is that,

except in case of fraud, the owner cannot, under any of its provisions, be compelled to pay any greater sum for the completion of a building than by his contract he has agreed to pay. The effect of the statute is simply to take from the owner money actually owing by him on his contract and to apply it in payment for the labor and materials which subcontractors or materialmen have contributed toward the performance of the same contract."

In other words, the mechanics' lien, under this rule, attaches primarily to whatever sum, if any, at the time the lien is filed may be due to the contractor. In many of the states, the lien of the subcontractor is based upon the legal theory of "equitable subrogation." This, translated into plain English, means merely that by the lien there is transferred to the lienor the claim of the contractor against the owner up to the amount of the balance then due or which may become due thereon.

Owner's Consent. With regard to the consent of the owner upon which the lien, as already noted, must under the usual rule be predicated, there is a wide divergence in the provisions of the various lien statutes. The principle is generally recognized as sound, but the states differ materially in the degree of consent or approval which their legislatures and courts interpret as sufficient to bind the owner. It has been stated broadly that some contract to which the owner is a party and which covers the work for which the lien is claimed is a necessary prerequisite to the validity of the lien. This does not mean, however, that to sustain the lien, there must be a written contract signed by the owner covering the work and embellished with legal acknowledgments and seals. The contract may be formal or it may be informal. The consent of the owner may be expressed most definitely in writing, or it may in some cases be implied. There must, however, as a general rule, be some understanding on the basis of which, whether it be by express agreement or by implication, the courts can say that the owner has approved, adopted or ordered the work. It will be in every case a question of fact dependent upon the peculiar facts of that case.

In the limited space here available, it is impossible to discuss in detail the variations between the different state statutes, and the legal interpretations by the varying states of facts which are held to constitute an agreement by the owner that the work be done. It may be stated broadly, however, that the tendency has been and is to be increasingly liberal in the interpretation of what constitutes a contract by the owner sufficient to sustain a lien. Some statutes require that such a contract shall be in writing. More and more, however, the states are recognizing the right of the lienor to sustain his lien in the absence of a written contract. Where this right is recognized, the courts or statutes proceed upon the assumption that the owner might contract for the work or approve it by implication just as surely as if he had made a formal contract. If it can be shown that the owner has consented that the work be done and has allowed it to be proceeded with, without objection and with his approval, this conduct on his part in many of the states is construed as an agreement by him that the work be done. Even in the jurisdictions which have most clearly recognized an implied consent by the owner as sufficient to sustain the lien, the lienor cannot safely predicate his lien upon the mere fact that the owner knew that improvements were being made and did not object to them. In some cases this might be sufficient to subject the property to the lien, and in some it might well be insufficient. For example, in New York it has been held that the mere general consent of the owner that a lessee in possession of the premises may at his expense make alterations and repairs, does not constitute within the meaning of the New York statute that "consent" by the owner which is necessary to sustain a lien; and that the fact that the owner knows that the work is going forward and even expresses satisfaction with the progress made and the work done does not subject the property to a lien, where he is in the position of a landlord and has no control or supervision over the performance of the contract. On the other hand, it has been held by the New York courts that a lien can be sustained in a case where a tenant has ordered work done and the plans for the work have been submitted to and approved by the owner.

This whole question of consent by the owner is difficult and somewhat technical. Where the work is done at the order of the owner himself, there can be no question. Where, however, the work is done without such an order but by the order of a tenant, the validity of the lien will depend in most states, and certainly in New York, upon the ability of the one asserting it to establish with reasonable clarity the fact that the owner knew of the work, that he approved it and consented to its being done, and that his course was such as to amount to an implied agreement on his part that it should be done.

The Court of Appeals of New York, on this question of consent, has thus stated the requirements:

"While it is doubtless true that the consent required by the Lien Law need not be expressly given, but may be implied from the conduct and attitude of the owner with respect to the improvements, which are in process of construction upon his premises; still the facts from which the inference of a consent is to be drawn, must be such as to indicate at least a willingness on the part of the owner to have the improvements made, or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed."

* * * *

"We may, therefore, fairly deduce from the decisions of this court upon the question now under consideration these various propositions: (1) That

no express consent is necessary on the part of the owner in order to bring the case within the statute providing for mechanics' liens. (2) That a consent may be implied from the conduct and attitude of the owner with respect to the improvements which are in process of construction upon his premises. (3) The facts from which the inference of consent is to be drawn must be such as to indicate at least a willingness on the part of the owner to have the improvements made or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed. (4) The omission of the owner to object to improvements made upon his premises by a tenant, when he has knowledge of the circumstances under which they are being made, is always an important fact bearing upon this question."

On the other hand, the same court has laid down the rule that, in order to establish under the statute a consent by the owner, it must be shown that his consent has been an "affirmative affirmation" in procuring the making of the improvement or that the owner had possession and control of the premises affected by the improvement and consented to it in the expectation that he would reap the benefit of it. The fact that the owner actually receives the benefit will go far to establish the fact that he has approved the work in the expectation that he will receive this benefit. If, being informed of the intended improvement and knowing that the work is being carried on, he stands by and allows it to go forward and receives the benefit of it, his consent will ordinarily be implied and the lien sustained. On the other hand, it has been held that it is not necessary that he should actually eject the contractor as a trespasser to escape lien liability, and that, if he forbids the performance of the work, his consent will not be implied, because he has not taken ejectment proceedings or physically removed the contractor from the property.

Performance of Contract. Assuming that the necessary contract by the owner or approval and consent by the owner have been established, it is necessary that the lienor establish a number of other fundamental points to sustain the lien. The lienor must prove in the first place that he has performed his contract, or that the owner has prevented his performing it or waived any failure to perform which there may have been. Performance in this connection does not mean performance to the point of perfection. The courts here invoke the rule of "substantial performance." If the work has been substantially completed in all essential particulars, the lien will be allowed and will not be defeated because some minor defects or omissions are apparent. If a few fixtures, for example, have been omitted, the value of which can easily be determined and is relatively small, the contractor will be granted his lien for the full amount less a reasonable allowance for making good the existing omissions. In the second place, the lien must be filed within the time limited by law, which time, of course, will depend upon the statute applicable in each state and will vary in accordance with the differing state laws.

Approval of Work. Where other conditions are present, as for example, where the approval of the architect is a condition precedent to recovery by the contractor or where, in the case of a municipal lien, a departmental approval or certificate is required, the contractor must produce the required approvals or certificates before he can sustain his lien. In a word, he must, in order to sustain it, produce the same proof which the courts would require him to produce in establishing the indebtedness of the owner in a suit by the contractor against him under the contract, if no lien had been filed. The lien is merely an additional remedy in the nature of security and does not give to the contractor the right to recover, in the absence of proper legal proof and evidence that the work has been done and that the value of the work is the amount which he claims.

Probably the greatest variation between our state lien laws is to be found in those provisions of the laws which have to do with the liens of subcontractors and materialmen. In some states they are granted direct liens by statute. In other states their liens are on the basis of "subrogation," which I have already mentioned. Where this doctrine is in effect, the subcontractor or materialman, to establish his lien, must show that the contractor with whom he dealt was himself entitled to a lien, and that there still remains due some unpaid balance from the owner to the contractor which can be applied to the satisfaction of the lien.

When we come to the subcontractors or materialmen of a subcontractor, we are naturally getting still farther removed from the primary obligation between the owner and the original contractor. For many years, those with whom the subcontractor dealt were considered too far removed from the building operation to be accorded any lien rights. The liberalizing process which we have noted, however, has in large measure removed this bar, and today those performing labor or furnishing materials to the subcontractor may now generally successfully avail themselves of lien protection.

Limitations Imposed. State legislatures have generally recognized, however, the danger of throwing open too widely the lien door to the entire line of subcontractors and materialmen and have, in the wording of the lien statutes, set up safeguards and limitations which must be observed, if the lien is to be sustainable. In some cases it is provided that the contract must be recorded. The recording of it may be essential to the lien of the contractor himself, or to the lien of the materialmen or subcontractors, according to the particular statute involved. In New Jersey, if the contract and specifications are filed in the office of the county clerk of the county in which the work is being done and before the work is commenced, the liability of the owner will be limited to the contractor, and the subcon-

tractors and materialmen will be precluded from enforcing mechanics' liens. It is important that this provision be held in mind by architects practicing in New Jersey and that they advise owners before the work is commenced to file the contracts and specifications, so as to secure this protection. There has been some question under the New Jersey decisions with respect to the effect of filing the contract after the work has been commenced. Under the more recent decisions, the only safe course to follow is to have the papers filed before any work whatever has been done. Otherwise, even if the filing takes place after an insignificant portion of the work has been done and before the work on which the lien is claimed has been commenced, the owner may not be able to set up the filing as a bar to the lien claim. For example, if the excavation for the cellar has been started before the filing date, a carpenter whose work has not been commenced until after the filing has taken place may nevertheless, it seems, assert a lien and plead that the filing of the contract and specifications is ineffectual because it did not take place before the commencement of the work.

Architect's Lien Rights. The liberal tendency which has been responsible for broadening the scope of the lien laws so as to take in subcontractors and materialmen and the others whose work has contributed to the improvement of the property involved, has been responsible also for extending the protection of the lien laws to architects. Under the earlier laws, the architect had no lien rights. As the laws developed, it was held that, to the extent of the value of services performed by him in the nature of supervision, he might maintain a lien. Gradually this right in many of the states has been extended and amplified. The next step was to grant to the architect a lien for the full amount of his services, including the preparation of the plans and specifications, provided he had supervised the work. Having reached this point, it was entirely logical and equitable that the statutes should be so amended and interpreted as to give to him a right to file a lien, whether he had supervised the work or not, provided that the work performed by him had benefited the property and been used in connection with its improvement.

This rule has been definitely established in New York state. Under the present lien law in that state, the architect may file his lien for the agreed or reasonable value of his services in preparing the plans or specifications, even if he has not been called upon to supervise the work. Of course, if his contract has required him to supervise the work and his failure to do so has been due to a breach of the contract on his part, a different question is presented. To establish his lien, he must show that he has performed his contract and, if he has breached it, naturally his right to the lien will fail in consequence. The next logical step will doubtless be a provision which will give to the architect a lien for the preparation of plans and specifications for the improvement of real property, even if the work is not proceeded with. In fact, efforts have already been made in New York to amend the lien law to this end. There is much to be said for the suggestion. The architect who has, at the request of an owner, prepared plans and specifications, has certainly done work for the improvement of the real property. If the owner elects not to use the plans and specifications, it may well be urged that he should not, by the mere failure to use them, be able to deprive the architect of his lien right. In order to assert this right, the architect should, however, be compelled to show, in all fairness, that the plans and specifications as prepared are such as were ordered by the owner and then they are in proper form. Doubtless the argument which has prevented this final extension of the law with respect to architects is that to so amend the statute would open the door in some cases to unjust claims and encourage the preparation of plans without proper authority, for the purpose of forcing an owner to make payment for them under threat of having his property encumbered by a lien. There is something to be said for this point of view. On the other hand, the lien on the property can always be removed on the filing of a bond. Where this is done, the bond takes the place of the real estate as security, and the matter can then be thrashed out in court and the property left free from the lien.

Probably the chief reason that the architect has not been given the right to assert a lien where the building has not been proceeded with arises from a failure of the state legislature to properly appreciate the difference between the character of the services rendered by the architect and the services rendered by the ordinary contractor or materialman. Obviously, a contractor or materialmen cannot be a party to the improvement of real property, unless the project is actually undertaken. If the work is not started, he is not called upon to perform labor or furnish materials. With the architect it is different. If he has agreed to prepare plans and specifications and does propare them, he has immediately made available to the owner material which can be used for the improvement of the property. He has, in fact, performed labor for the improvement of the property and improved it in the sense

that he has laid out the scheme for the work of improvement and the specifications under which it is to be carried forward. Under a statute which gives a lien for work done "for the improvement of real property," as distinguished from work done "in the actual improvement of" real property, services of this character might well, and logically, be made the basis of a lien. It is a question of time only, I think, before this result will be secured, in some jurisdictions at least.

Jurisdictional Difficulties. It must be borne in mind at all times that the lien statutes vary materially according to the jurisdiction in which they are in force. No lienor can safely file a lien in one state on the basis of the requirements of another state. There is as much difference between the lien laws of the various states as there is between the divorce laws of the various states. While many of the considerations which have led to the agitation for a uniform divorce law do not, of course, apply to lien legislation, there is much to be said in behalf of the proponents of a uniform lien law. Increasingly, under modern industrial conditions, contractors and materialmen and architects, also, are being called upon to perform services in states other than the states in which their offices and chief activities are centered. If a uniform law could be made available, it would greatly simplify lien procedure.

In this connection, the Department of Commerce, through "The Standard State Mechanics' Lien Act Committee" has been active. It has just issued, as I write, a second tentative draft of a proposed uniform mechanics' lien act, and submitted it for general consideration and comment. The Act as submitted is well worth the reading of every architect, and shows clearly the careful consideration which the Committee has been giving to this subject. Special consideration has been given to the problem of how best to secure the protection of the owner against liens and at the same time fairly recognize the rights of the contractor and materialman. Various remedies have been suggested and, as is natural, some have tended to make the owner a collection agency for subcontractors and materialmen, and others, on the contrary, to set up too stringent provisions for his protection. Much good, will, I am sure, result from the work of this Committee and, if, with the coöperation of bodies such as the American Institute of Architects and associations of contractors, it should bring about a uniform law so drawn as to be liberal and yet not over-radical, the result would do much to simplify a somewhat confused situation. Certainly it would bring about a far more accurate understanding of lien legislation and of the respective rights of the owner, contractor, materialman and architect in connection with it.

The Architect's Interests. Pending the dawn of the millennium in this respect, the practicing architect will do well to acquaint himself generally with the provisions of the lien laws applicable in the jurisdiction in which his practice is carried on. He should do this both in his own interest and in the interests of his clients. He may wish to avail himself of the protection of the law, and in every project of any size he will be called upon to consider his client's protection in any event. The more thoroughly he understands the provisions of the lien law, the more competent he will be to advise his client and to protect the latter's rights and interests. It may perhaps be true that his legal duty in this connection will be accomplished if he suggests to his client that the latter should have his attorney advise him in connection with any lien considerations and the steps to be taken under the contract for his protection against liens. On the other hand, the architect whose conception of his duty is somewhat broader and who goes out of his way to advise his client and to protect him from lien complications, will build up, as a result, good will and confidence on the part of his clients, the benefits of which cannot easily be over-estimated.

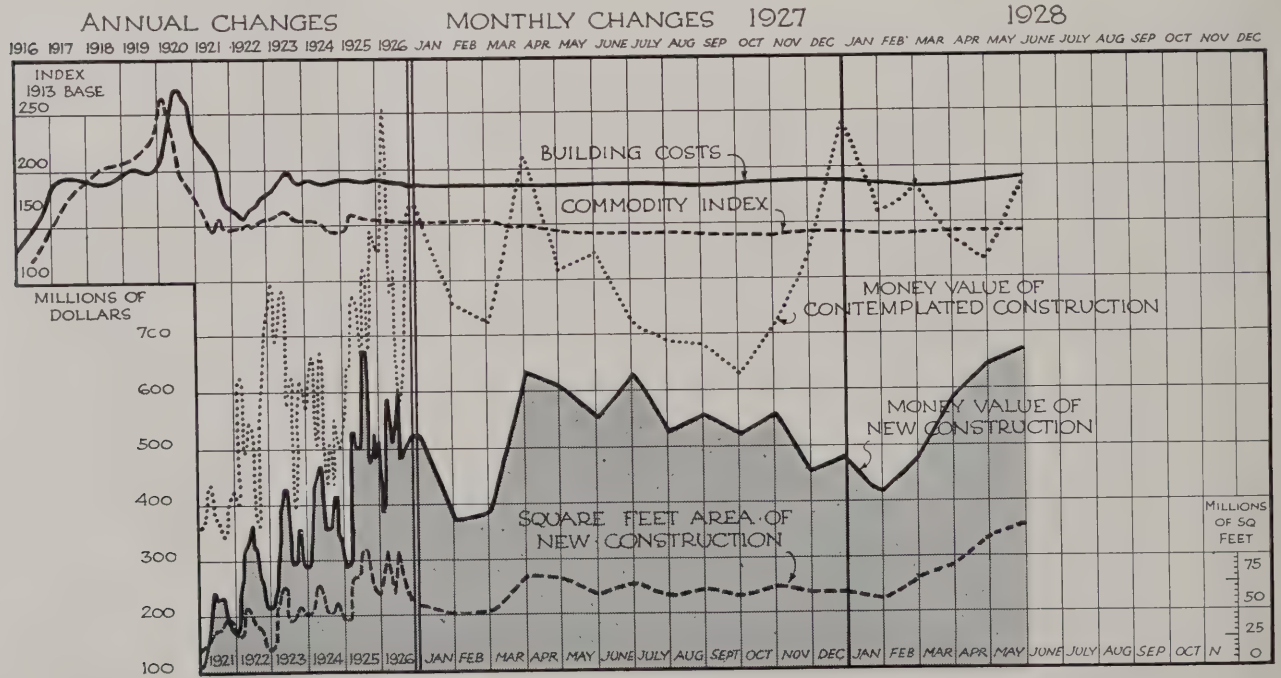
In any event, the architect should see to it, in drafting the contract and specifications and in advising with respect to them, that the owner is protected by the insertion of proper provisions for the withholding of the final payment and for the submission by the contractor, with his requisitions, of statements and receipts showing the payments made to subcontractors and materialmen. If the architect certifies payments without these precautions and allows the owner, on the basis of these certifications, to pay out monies to the contractor when the contractor has not in turn properly taken care of his subcontractors or materialmen, he may well be held to account by the owner for negligence. The only safe course for him to follow is to exercise special care throughout the operation in checking the outstanding claims of subcontractors and materialmen and in being entirely satisfied with respect to the condition of their accounts, before issuing certificates. The architect is in a position to protect the owner in this connection. This protection he should be diligent in giving, as a fulfillment of the obligation which he owes and as a matter of ordinary good business in his own interests for it is to his own interests to have a good reputation.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

FOR two consecutive months all construction records in the 37 states east of the Rocky Mountains have been broken, according to reports of the F. W. Dodge Corporation. In April, building and engineering work contracted for in these states (representing about 90 per cent of the total country) amounted to $643,137,100. In May the total was $668,097,200. Only six times prior to April have the month's totals exceeded $600,000,000, these being in August, 1925, March and August, 1926, and March, April and June, 1927. Similarly, the totals for the year to both April and May constituted new records. In April the total for the first four months of the year was $2,128,204,100, which exceeded the values for the similar period to 1927 by 6 per cent. In May the year's total rose to $2,796,301,300, which is 9 per cent over the first five months in 1927 and 7 per cent over the same period in 1926.

In April three sections of the country saw records broken; the New England States, where the value of construction for the month was 9 per cent over last year and 10 per cent over last month; the Middle Atlantic States, where two large contracts totaling $27,500,000 were largely responsible for an increase of 40 per cent over April, 1927, and 47 per cent over March, 1928; and the Central Western States where April totals for this year were 13 per cent over April, 1927, and 7 per cent over last month. In May four districts broke all former records for the month. New York state and northern New Jersey showed a 22 per cent gain over the preceding month and a 33 per cent increase over the same month last year. The expenditure of $184,555,000 in contracts made this also the highest monthly total since December, 1926. The New England States continued to show unusual activity, with a May total of $60,229,800, which is the record monthly total for the district, and which represented an increase of 30 per cent over April, 1928, and of 45 per cent over May, 1927. The Middle Atlantic States also established a new record for May with $76,937,300 worth of contracts, which was 38 per cent ahead of May, 1927, but was 25 per cent under the total for last month, for reasons already indicated. In the Central Western States the total, $192,868,300, was a 27 per cent increase over May, 1927, and 3 per cent ahead of April, 1928. For the 37 eastern states, analysis of the month's totals shows that 43 per cent of all contracts in April and May were for residential construction. Increased activity in public works, industrial and commercial buildings is indicated in these interesting figures.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

COSTS AND SPECIFICATIONS

BY

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THE silence which settled over the little group of tourists in a corner of an ancient and lovely cathedral was shattered by the exclamation: "I wonder how much the damned thing cost"! So are many of our dreams shattered when measured by the modern standard of value,—money!

The only way in which the architect's ideas can find tangible and concrete expression is by means of drawings and the written word in the form of specifications. Drawings are limited almost entirely to their function of illustrating the design and dimensions of each individual portion of the work. The specifications are capable of expressing accurately the multitude of conditions which require consideration to carry out the architect's ideas in conformity with modern methods of transacting business. An essential qualification of a specification writer is the ability to obtain the best possible value for the money available. In this respect he bears a striking resemblance to the purchasing agent, and like him should be thoroughly familiar with the market conditions affecting building materials. The specification writer should also be an expert on the qualities and grades of the multitude of materials which enter into the construction of a building. The selection of the proper material for a given purpose is the result of years of experience and the proper contacts with authorities on the various phases of building construction.

A specification which has been loosely compiled and which contains meaningless paragraphs will add to the cost of the building, for the reason that it will create a condition where the owner will pay for many things which he will not receive. Under these conditions, an experienced contractor will estimate to cover himself from loss, no matter what the architect's future interpretation will be. When a specification is carelessly compiled and indicates that the architect is ignorant of the proper administration of a building project, the contractor will often feel that he can "crash the gate," and again the owner will pay for many things which he will not receive. Many contractors work on the theory that the best defense is a good offensive; therefore, when a carelessly compiled set of specifications and a poor set of plans are encountered, these contractors will take the aggressive to protect their interests, generally with considerable success, so that again the owner will pay for many things which he will not receive.

The architect's position in the modern business structure is sound and conforms to the established economic theory that design, plan and supervision should be detached from that of execution. The architect's position can be maintained only while he works in conformity with this economic principle, which should result in the preparation of carefully compiled specifications and accurately detailed plans, so that the contractor will confine his energy to execution only and will not invade the architect's and engineer's sphere of design and selection of materials. The success of a project will depend generally upon a logical plan and a scientific and business-like selection of materials, with the element of cost balanced against desirability for the purpose. The cost of a product should include the initial cost plus the cost of maintenance. The money spent in the construction of a building becomes an item of overhead which will be chargeable to the taxpayer, tenant, merchant or manufacturer, depending upon whether the building is for public use, tenant use, sales, or manufacturing purposes. Successful business executives are constantly striving to legitimately reduce overhead, for the reason that this charge must be added to the price of the commodity which will be manufactured or sold. If this overhead charge is excessive, it will impose a handicap on the commodity when in price competition with one which enjoys an overhead charge of lesser amount. This economic theory is not inconsistent with good architectural design, because it conforms exactly to the theory that good architecture should accurately express the purpose for which the building was constructed. Our modern architectual design at its best recognizes this theory, and is producing truly American architecture which accurately expresses the spirit of the age and the purposes for which buildings are constructed. A specification carefully compiled will take into consideration each and every angle from which the building can be appraised, so as to cover and include all contingencies. A specification so compiled will earn the respect of all affected and will form an instrument used as a means of trade and agreement to the end that all affected will enjoy its protection. This type of specification definitely establishes the liabilities of each individual affected, to the end that the operation will proceed smoothly to completion to the satisfaction of all concerned. This should be the ideal of all specification writers.

The most desirable material for a given purpose is frequently not the most expensive material. The familiar expressions: "Do not use nickel-plated lath," and "Do not gold-plate the job," express the thought. If the market is carefully investigated, there will be revealed the fact that considerable sums of money can be saved without injuring the character of the work in any respect, and in fact often improving it. Buildings in which expensive materials are used in service and storage portions are victimized generally by carelessly compiled specifications with the familiar clauses: "All trim shall be mahogany"; "All floors shall be terrazzo"; "All

balustrades shall be bronze as per detail"; and similar clauses which the supervisor interpreted exactly as written, irrespective of the location. The value in quality and money between the different grades of a given material should always be kept in mind, as very often the difference in price between the different grades is out of all relation to the difference in quality between them. This condition is due largely to the specification writer's requiring the very best grade of a given material in almost all instances, which results in a demand which causes a premium to be placed on the particular grade, while a slightly inferior grade, perfectly suitable for the purpose, will clutter the market. As an example, the difference in price between "A" dense heart rift yellow pine flooring and "B and better" dense heart rift yellow pine flooring, is out of all relation to the price difference between them. The price difference between "AA" quality window glass and "A" quality is out of all relation to the quality difference. A light of double thick "AA" quality window glass, 24 inches by 30 inches, has been quoted at $1.56 at warehouse, New York. A light of "A" quality glass has been quoted at $1.05. The difference in quality between these two grades of glass is so slight that it cannot be established by the average supervisor of construction. Expert graders of glass will not agree on more than 70 per cent of the "AA" quality glass. "A" dense heart rift long leaf yellow pine flooring 13/16 of an inch thick, has been quoted in the metropolitan territory at $130 per thousand. "B and better" dense heart rift yellow pine flooring has been quoted at $110 per thousand. These prices cover flooring delivered at the site. There is very little difference between these two grades, as "B and better" flooring contains 50 per cent of the "A" quality. Therefore, in ordinary cases the "B and better" would be the logical flooring to use, as the differences are of such a nature that they cannot be detected except by an expert. Similar and more exaggerated examples could be given at length.

When considering the item of cost, it is well to bear in mind that the difference in prices of raw materials will not bear the same relation when incorporated within the bulding. Let us consider an ornamental metal grille. The price difference between rough cast bronze and cast iron is about 10 to 1, whereas the price difference between the same grille in cast iron and bronze would be about 4 to 1, the proportion being cut down for the reason that the cost of the models and patterns would be the same in either case. It is possible to design an ornamental metal grille so that the cost of the model and pattern, coupled with the item of breakage for cast iron, would be so great as to compensate for the price difference between the metals. These examples are given to illustrate the proportional differences in cost between materials delivered at the site and the same materials incorporated within the building.

Example. Wrought iron pipe will cost approximately 40 per cent more than steel pipe. The cost of the pipe material for a plumbing system on an 11-story office building was 25 per cent of the cost of the entire piping system, exclusive of the finished plumbing fixtures, which reduced the percentage cost of the wrought iron pipe over steel pipe to 7 per cent in place, the percentage of additional cost being reduced for the reason that the items of labor, valves, pipe covering, painting and similar work were the same in either case.

Example. A light of double thick "B" quality window glass, 14 inches by 18 inches, will cost about 20 cents at the warehouse. A light of ⅛-inch or ¼-inch polished plate glass of the same size will cost about 52 cents at the warehouse, which is 160 per cent more than the double thick "B" quality glass. It will cost approximately 20 cents to glaze either light of glass, or 40 cents for the "B" quality and 72 cents for the plate glass, a price difference of 80 per cent between them.

Example. Strip copper in sheets is worth 25 cents per square foot based on 16-ounce copper. Galvanized iron is worth 5½ cents per square foot in sheets, which is less than one-fourth of the cost of the copper. Plain copper cornice or moulded work will cost approximately 65 cents per square foot in place. The same work in galvanized iron painted would cost approximately 40 cents a square foot,—about two-thirds of the cost of the copper work.

When other materials are involved it will frequently be found that the cost differences between the two classes of work will not be anywhere nearly as great as if the other materials were not involved. For instance, galvanized iron skylights are quoted at approximately $1.20 per square foot, whereas copper skylights are quoted at approximately $1.70 a square foot. In this case the difference between them will be reduced, due to the fact that the other materials, such as, glass, puttying, labor, painting, etc., are the same in either case. For this reason galvanized iron skylights, except for highly speculative work, is a poor buy. The specification writer should investigate very carefully the element of cost, as it affects all substituted or sub-standard materials. He should carefully analyze and check all statements made in relation to the ultimate costs of these materials. I am quite familiar with more than one case where substituted and sub-standard material will cost in place as much as the standard material which they were designed to replace. When asking for prices, the price quoted will very often be f. o. b. factory, when it is customary to quote the same material in place. The price will often be quoted so as not to include some essential item of finish which will materially increase the price.

The materials used in the constructoin of a building can be roughly divided into two portions,—one raw materials, and the other manufactured materials. Raw materials, which comprise generally wood and stone in their multitude of sub-divisions, are products of nature, and as such are not subject to adulteration or alteration in quality, except such as

will occur during growth or formation. The specification writer and the supervisor of construction should be thoroughly familiar with the various kinds and grades of these materials and their adaptabilities for different purposes; for this reason it is unimportant from whom these materials are purchased. Steel, cement, copper and tin may also be classed under this heading, for the reason that their quality is stabilized by the equipment and resources behind them. When specifying manufactured materials, a different condition occurs, for the reason that the processes of manufacture are technical, and it is difficult to establish the quality of a given material without laboratory tests. When called upon to specify paints, asphalts, waterproofing compounds, mastic and rubber flooring, etc., it is better to spend energy investigating the manufacturers and to select one of recognized standing and integrity and then let him take care of the responsibility for the success of the material. Questioning whether it were possible to determine the quality of two kinds of rubber tile outside of a laboratory, I consulted with three experts on rubber and two purchasing agents, and they all agreed that it was not possible to establish the quality of the two rubber floor tile outside of a laboratory, despite the fact that there is a 60 per cent price difference between them. The company behind products of this nature is of more importance than the product itself. To prevent any question in the estimator's mind as to whether the material specified is the proper material for the purpose, it is important that proper selection be made, so that the product and grade will be logical for the purpose.

To bring out the various questions which should be answered before selecting a given material, these examples are given:

Brick Work. There are two basic types of brick, —common brick and face brick. Common brick has been defined as a "moulded solid unit of burned clay, the standard size of which is 2¼ by 8 inches, not specially treated to produce either color or texture." Face brick can be defined as "a solid unit of burned clay specially treated to produce either color or texture." This treatment may consist of varying the process of manufacture, such as scoring the face or repressing the brick. It can also be obtained by different burning methods or by adding substances to the clay to produce special color effects. The grading of common brick varies with the locality. In the metropolitan district, which consists of New York and adjacent territory, bricks are graded as: Light Hard or Salmon Brick; Hard Burned Hudson River Common Brick; and Lammy or Arch Brick. Light Hard or Salmon Brick are brick somewhat underburned and of lighter color than the regular run, but are sufficiently strong for ordinary use, except that they will not stand exposure to the weather. Hard Burned Hudson River Common Brick are the standard brick normally sold, and upon which all market quotations are based. Lammy or Arch Brick are the overburned brick which are often darker in color than the regular run, and are usually misshapen, varying from a slight degree to what are sometimes called "swelled" or "burst" brick. Physically, these brick are equal to the standard brick, except that their shape is distorted, and their use is usually confined to the exterior facing of the building to obtain architectural effects. The demand for these bricks often causes a premium to be placed on them.

Probably the best known common brick is the "Harvard" brick, so called because of its extensive use in the buildings of that university. Harvard brick is a New England common brick, and is a moulded open-yard, water-struck, wood-burned brick, sorted for color and handled with tongs. There is a definite trend back to use of common brick for facing purposes, due to the various architectural effects which are possible with the use of the different grades of common brick. Face brick, as we now know it, is a comparatively modern product, and does not possess the architectural background that common brick possesses, and it is not as economical, either in the cost of the brick itself or in the cost of laying. Many effects can be obtained with common brick by the use of the different bonds of brickwork and the use of different jointing. Instead of using special headers for effect, the heads can be broken off, which will cause a difference of texture and color with the stretcher brick. Investigation will reveal many other effects possible with common brick which will reduce the cost of the work materially.

Face brick is manufactured in various colors and textural effects, and in addition it will vary considerably in physical properties. The specification writer should look carefully into the cost of laying the different types of face brick, as those which have a very low rate of absorption are what a brick layer calls "floaters," and will cost considerably more to lay than brick with a relatively high rate of absorption. It is now becoming generally known that a brick with fair absorptive qualities will help produce a dry wall, due to the fact that it will bond better to the mortar and that the water will mushroom across the face of the brick and allow the heat and sun to absorb the moisture through the brick, whereas a brick of low absorptive value will not bond well to the mortar, and the water will find its way through the mortar joint into the interior, as it cannot be absorbed through the brick. The best grade of face brick is generally selected for color and mechanical properties, brick of one shade and perfect mechanical properties being the most expensive. This class of brick is often desirable for the interior of a building, but it should be used rarely for the exterior facings, due to the fact that it is not considered proper to produce a dead wall of one shade. Also a brick of perfect mechanical properties leaves much to be desired in the texture and general effect of the wall surfaces. With these considerations in mind, much can be saved in the selection of the face brick.

In laying brick, the character of brickwork has considerable to do with the cost of the finished work.

Face brick laid from an outside scaffolding is very much more expensive than brick laid from an inside scaffold, or "overhand brickwork" as it is known in the trade. Face brick should always be laid from outside scaffolds, for the reason that the mason can see what he is doing and can judge the effect of his work. When laying the brick from the inside of the wall, the mason cannot see whether the joints are plumb or not, nor can he judge the effect of the work he is doing. The estimator for brick work is interested to know whether all the headers used in Flemish, English, Dutch or cross bond will be through headers, or whether every third or fourth header will be a through header. It is customary to have the same number of headers in this class of work as would be used in common brickwork, with every sixth course a full header bonded to the backing. Care should be used to carefully specify all special angle brick, ground brick or moulded brick, and exactly where they will occur; if not, the contractor will assume that standard brick clipped on the site will be used for these purposes.

The cost of the different classes of common brick will vary considerably in the locality in which the brick is purchased. It will also vary considerably depending upon the demand for the particular kind of brick. At the present moment in the neighborhood of Newark, Lammy or Arch Brick have been quoted as high as $40 per thousand, when the standard Hard River Brick were being quoted at $18 per thousand delivered at site. The difference in cost of the various classes of common brick is so variable that it should be obtained from local dealers in the different localities. There are some sections of the country where common brick are not selected but are delivered as kiln run, which is just as they come from the kiln without any selection at all. The New England Brick Manufacturers' Association are grading their brick now as Merchantable Brick, consisting of 50 per cent suitable for facing and 50 per cent suitable for backing; Common Face Brick, consisting of brick from the body of the kiln suitable for facing; Selected Common Face Brick, consisting of brick specially selected to meet architects' specifications; and backers, which consist of all brick suitable for backing-up purposes. The grading went into effect January 1, 1928. Face brick will vary considerably in price and to such an extent that it is almost impossible to furnish any definite price data in relation to them. It is, therefore, important that the specification writer consult with the local face brick dealer for information in connection with the prices on face brick.

Cut Stone. There are various types and grades of stone used for building purposes. The type and kind of stone will vary somewhat in the locality in which the stone will be used. Limestone is used to a far greater extent than any other stone for building purposes, and for this reason it will be used as an example of some of the considerations which should be given to the question of cut stone when specifying. There are various grades of limestone. The standard grades are: Select Buff, Select Gray, Standard Buff, Standard Gray, and Variegated. The cost of limestone will vary according to the grade specified, the first named being the most expensive and the other grades in the order listed. There are also some special grades of limestone where unusual veins of stone are encountered in the quarry. A very hard grade of limestone is also quarried, which is suitable for door sills and exterior steps. It is well to keep in touch with the local stone yards so as to be familiar with the price variations between the different grades. All of the grades mentioned, with the exception of the hard limestone, have about the same physical properties, so that the selection of the particular stone for a given purpose should be for effect desired and not on a price basis, unless price is the dominant factor. Variegated stone has been used with considerable success for buildings of Gothic architecture, whereas select buff is more suitable for Classic architecture.

Here is a price list on the different grades of Indiana limestone, and is the cost per cubic foot of the stone in blocks, f. o. b. cars New York:

Grade of Stone	*Scabbled*
Statuary Buff	$1.92
Select Buff	1.67
Standard Buff	1.57
Coarse Buff	1.42
Rustic Buff	1.42
Select Gray	1.57
Standard Gray	1.47
Coarse Gray	1.32
Variegated	1.47
Old Gothic	1.32

Contractors in the metropolitan territory are estimating limestone at about $5.25 per cubic foot for ashlar work and approximately $5.50 for plain moulded work. This will give some idea of the relation that the cost of the stone delivered will have to the cost of the stone in place. The finish of limestone has a bearing on the cost. Stone used just as it comes from the saw or planer is the least expensive, while special hand-tooled effects are the most expensive. Between these two extremes there are many desirable finishes, such as shot sawed; tooled; planer finished, with the edge of the tool broken to create the effect of hand-tooled work when set. Various finishes can be used upon the same building with good effect. About 30 years ago, prior to the general use of machinery for finishing and sawing stone, this work was almost always done by hand, and machine-cut stone was not considered the proper thing among the architects of the day. It was during this period and earlier that rusticated ashlar was in vogue. This type of work would be extremely expensive today, because it would have to be hand-finished after it was sawed, unless there were enough scrap around the quarry to supply the particular demand. When specifying cut stone, it is important

to specify who will furnish the anchors. It is also important to specify the thickness of the ashlar and whether the ashlar will be back-checked at the columns, window jambs and corners, or whether the 4-inch ends of the ashlar can show at these points. When electric or other outlets occur on columns, it is important to indicate these on the details and specify that these should be cut or drilled by the stone contractor, which can easily be done at the shop. If these outlets have to be drilled at the site, considerable expense will result.

Carpentry and Mill Work. An investigation should be made of the kinds and grades of timber which are used locally. Wood used extensively in certain localities will be cheaper than in localities where it is not stocked. Along the eastern Atlantic sections, particularly along the shipping points, there is a considerable quantity of Douglas fir timber. In other localities yellow pine will be in demand. Care should be taken that the proper and exact grade for a given purpose is specified and that this grade be according to recognized established grading rules. These rules should be investigated so that the proper grade be selected for a given purpose. The difference in price between Prime long leaf dense yellow pine and Select Structural dense long leaf yellow pine is out of all relation to the quality difference between them. Ninety-nine per cent of Prime would grade as Select Structural. When specifying yellow pine, it is well to specify the locality in which the timber shall be cut. For instance, very little virgin growth yellow pine is cut in the eastern states, with the exception of a small portion of Florida. By far the best pine comes from Mississippi, Louisiana or Texas. The quality difference between this lumber and the second growth lumber in the eastern states may make it well worth while to specify the western lumber, as this is virgin timber having a slower growth, and therefore it is more dense in structure.

The lumber industry maintains what is known as "inspection service," by which at a slight fee the lumber delivered can be re-inspected so that the architect may be sure that the lumber delivered is what is specified. In case of dispute as to the grade of lumber delivered, it is customary to require an inspection, in which case the loser generally pays the cost, which is in the neighborhood of 50 cents a 1000 board feet. Many architects are unfamiliar with the standard sizes of rough lumber as it comes from the saw mills, and do not seem to have a clear idea of the sizes it will be after it is kiln dried and finished ready for the building. Lumber for millwork is sold by the inch, and the price quoted will be per 100 lineal feet, so that when quoting $1.50 an inch for a particular kind of wood, that means $1.50 per square inch of cross section of stock from which the moulding will be cut per 100 lineal feet, and not the cross section of the actual size of the moulding. Therefore, it is very important for the detailer and specification writer to bear in mind standard sizes of finished lumber, which are about as given here.

Rough lumber will be sawed in the mill to the thickness of ⅝ inch, ¾ inch, 1 inch, 1½ inches, 2 inches, 2½ inches, 3 inches, 4 inches, 6 inches, and in 2-inch units for thicknesses thereafter. The widths will be in units of from 2 inches up to 14 inches, the narrow boards being more numerous than the wide boards. Lengths in lumber will run in even feet from 6 up to 16 feet, though more 8-, 10- and 12-foot lengths can be had than the 14- and 16-foot lengths. The thicknesses of the lumber quoted are in the rough stock as shown. These thicknesses will shrink or work off in the manufacture, so that 1-inch lumber will finish approximately 13/16 inch thick; 2-inch lumber 1¾ inches thick; and 2½ inches thick will be worked from thicker lumber. The shrinkage in width will vary with the different woods, so that when a ⅞-inch moulding is detailed it will require a 1¼-inch stock to produce it. Sash in doors are 1⅜ inches, 1¾ inches, 2¼ inches and 2¾ inches thick. If large quantities of a given moulding are required, it will cost no more to have this moulding detailed and specially run than to use a stock pattern. But if a small quantity of a given moulding is required, it is much better to use a stock pattern in order to save the set-up charges.

It is unwise to specify that window boxes will be made of clear white pine or cypress throughout, with Georgia pine pulley stiles and parting strips. Such a frame would be a waste of money, the requirement being that the sills, outside mouldings and exposed portions of the box be of white pine; the pulley stiles and parting beads being yellow pine, and the rest of the frame of good, sound, merchantable lumber free from large, loose knots, shakes or similar defects. In specifying the size of the pulleys, it is well to get a sample and lay it over the detail and see whether the center of the sash cord will actually fall in the center of the box. If the pulley is too large or too small, the weight will drag against either side of the boxed frame. I find very few draftsmen who pay any attention to this when detailing. Window frames and sash should always be detailed. Few stock frames and sash are made that are really substantially built and weatherproof. By detailing them, a greater variety of sizes can be obtained as well as a stronger and better frame and sash.

The exact character of interior finish should be clearly specified. The types generally required are: "Straight Mill Run Job," which consists of the trim being delivered in lengths and then put together at the site; a "Made Up Job," which consists of the door jambs, window and door trim, mantels and similar work built complete in the shop and delivered ready to set in place in one unit; a "Mill Cabinet Job," which requires the assembling of fine grade veneering, trim, wainscots, etc., in the mill, building up in complete units, and delivering it at the site where the carpenter sets it up and the painter finishes it; a "Strictly Cabinet Job," which requires the complete construction of all of the woodwork in the

shop of the cabinet maker. It also covers the building up of the special veneerings which are required to produce the effect desired.

When a fine cabinet project is encountered, it is always well to select the exact flitches of the wood beforehand from a reputable hardwood dealer. These woods are then filed in the architect's office and are referred to by name, grade and sample, so that the cabinet maker will know exactly the type and kind of wood to estimate upon. It is particularly important to take care of this item in rare woods, for the reason that there is a great difference of opinion as to what might be required. For instance, when specifying English Oak the question is whether oak from England is required, in which case a tree is selected in which the sap has stopped running and which is about dead. Wood of this type costs considerably more than what is known as Commercial English Oak, and this same principle rules in more or less degree with all types of hardwood. It is, therefore, important to consult with a hardwood broker and select the exact wood wanted for this type of work, and to obtain comparative prices.

Summary. An attempt has here been made by means of a few examples to give some idea of the different conditions which must be considered before the preparation of a specification for a given trade. The examples by no means cover all of the considerations. They are merely intended to give some idea of the procedure required to establish just what should be used for a given purpose. The specification writer should carefully consider the far-reaching effects of his specifications and should remember that the element of cost can never be disregarded but that it affects the earnings not only of the developer of the project, but the multitude of people in all walks of life who invest in modern mortgage bonds. It also affects the tax-payers in various communities where public buildings are being built. To keep faith with these people and at the same time to erect proper buildings, calls for the very best and for all of the efforts that an architect has at his command. This responsibility must be met and should not be shirked, for if the architect does not rise to leadership and assume this responsibility, it will be assumed by others not as capably trained or as well fitted for the work, to the end that the control of specifying will gradually pass out of the hands of the architect, which will seriously affect the practice of architecture in America.

Jefferson School, Maplewood, N. J.
Guilbert & Betelle, Architects

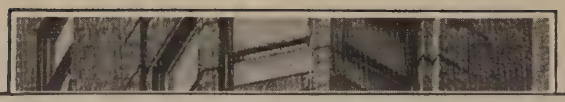
THE ARCHITECTURAL FORUM

IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

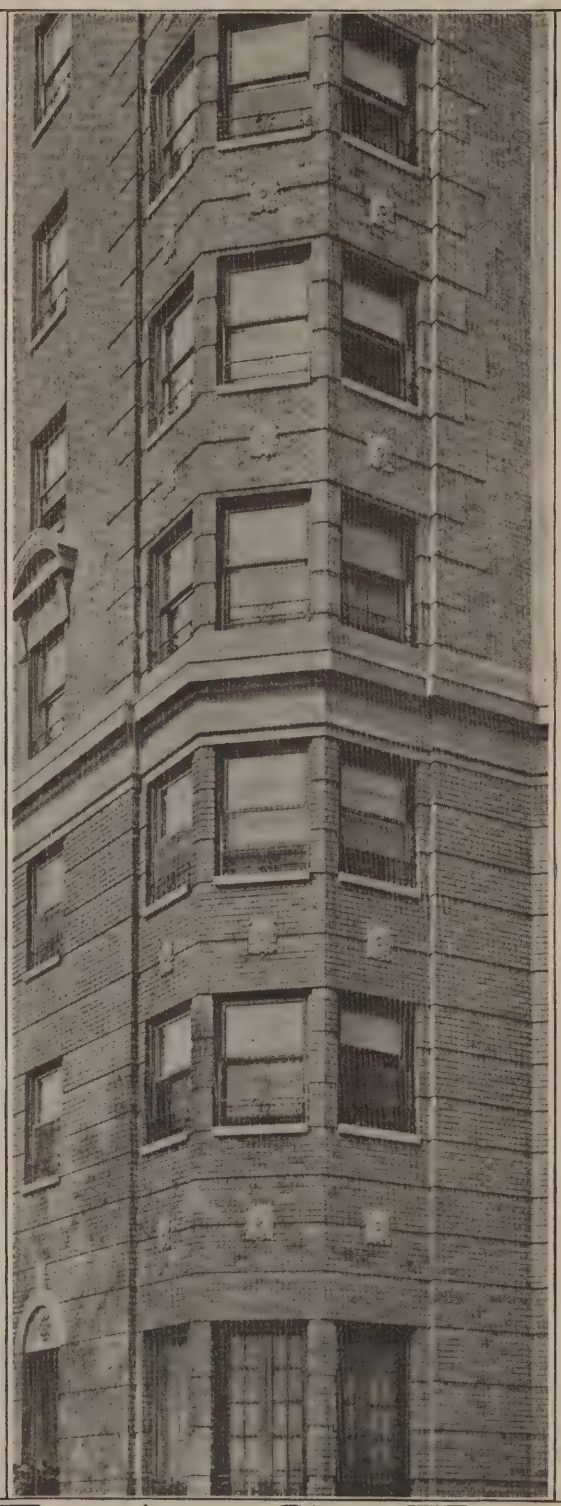
AUGUST

1928



Another Tribute to Masterly Designing and Face Brick

"1400 LAKE SHORE DRIVE," HOOPER AND JANUSCH, INC., CHICAGO, ARCHITECTS



THE age-old charm of Face Brick . . . in the modern manner. In these few words is told the achievement of the Architects in one of the nation's largest co-operative apartment buildings. Gray Face Brick, characterful and true to the inspiration of the designers, were used on all sides and laid in simple running bond with depressed header courses. The building has a rusticated base up to a stone belt course, above which the corners are treated with Face Brick quoins carried across the bays and extended across the Face Brick mullions. Lintels are also of Face Brick. For the obtuse angles specially shaped Face Brick were used. The dignity and distinction attained in this luxurious building is but another tribute to masterly designing and FACE BRICK.

FACE BRICK

. . . . . endless blends of everlasting colo

AMERICAN FACE BRICK ASSOCIATION

2151 City State Bank Bldg., Chicago, Illinois

BOOK DEPARTMENT

THE LINEAGE OF AMERICAN ARCHITECTURE

A Review by
HAROLD D. EBERLEIN

FOR architects and for students in architectural schools there are here provided stimulus and abundant suggestions in the analysis of the essential factors and influences that have played a part in reaching the complex result we call modern American architecture. For the general reader, this volume affords a comprehensive and intelligible summary of the story of domestic and public architecture in America, so lucidly and succinctly presented that it compels attention. Furthermore, the author's manner of treating his subject has such a rapid and easy flow of narrative, unobstructed by technicalities, that it is calculated to engender interest even where indifference ordinarily prevails. The logical course of a fascinating development is aptly illustrated by happily chosen specific allusions to mark each phase of progress. As to actual half-tone illustrations, there are 48 of them. They are carefully selected and really illustrate the text,—as far as they go,—but it is a pity, in a volume of this sort, where abundant illustrative material for reference and comparison is not only helpful but expected, that there are not at least three times the number,—and more if possible. The one serious shortcoming of the book is its shortage of illustrations. Nevertheless, those that are given are thoroughly representative and cover as wide a range of subjects as is possible with the limited number. It is interesting, in this connection, to find the old Eastern Penitentiary, in Philadelphia, shown as an example of the early "Gothic Revival" type, as well as several other structures, little known but highly significant as examples of their several kinds of architecture. There is an index and a very useful classified bibliography, bringing the physical compass of the volume to 262 pages. Within that space a really exceptional quantity of valuable material has been compressed.

In the first chapter, "The Beginnings," the initial efforts of the colonists are traced. The second chapter, entitled "The Afterglow of the Middle Ages," points out what comparatively few people realize,—that many mediæval survivals, of one sort or another, continued to exert a perceptible influence on this side of the Atlantic until well past the close of the seventeenth century and, indeed, lingered on long after that date in many out-of-the-way and ultra-conservative communities. The author then sketches the bursting into full bloom of the Georgian episode, with its characteristic local variations; and then, immediately following, he summarizes and explains the provincial types of the seaboard, those types that are truly "Colonial" and instinct with vernacular vigor,—English, Welsh, Swedish, Dutch or German in origin, and each evolved in its own distinct way. In this review of traditional trends, modified by local conditions until they have become virtually indigenous, the building of the French and Spanish outposts of early America is not forgotten. With the dawn of the federal era in the infant republic, there is unfolded an impressive program of building, stimulated in great measure by Thomas Jefferson, "Jefferson turned to the ancients, to the Greeks and Romans, whose republics then, in the freshness of modern republicanism, seemed very near. He hoped to secure the respect of foreigners, without copying them,—to be at once novel and correct. The new political order had far reaching consequences. It called into being governmental buildings which were not only more important than those of the colonies hitherto, but were of types radically new in the modern world."

It is matter for some regret that the author has not drawn a sharper distinction between the Græco-Roman or Regency phase of Classic design and the more rigidly archæological Neo-Grec episode that followed it. Of the former, with its consummate grace, the most conspicuous exponent was Latrobe, with the same ideals as those sustained in the mother country by Cockerell and Mylne, Nash and Henry Holland. For the strongest impetus to the more insistent archæology of the Neo-Grec fashion, we must look to traveled and cultivated laymen such as Nicholas Biddle, Samuel Fox, Joseph Fox and, of course, Thomas Jefferson who, however, despite his championship of Greek austerity, time and again showed his hankering after the easier, warmer and more flexible grace of the Græco-Roman blending. That the lay impulse was chiefly responsible for the purely Greek trend, is aptly instanced by the words satirically put into Latrobe's mouth by Thornton:—"The Bank of Pennsylvania I know has been much admired, but it would have been much handsomer if Joseph Fox and the late John Blakely, Esqrs. directors, had not confined me to a copy of the Parthenon at Athens." The author then continues, "the authorities of the bank, who owed much to Latrobe's skill, appear to have been untimately responsible for the essentially American literalness of its classicism." The wave of romanticism and the early "Gothic Revival," in which even Latrobe, Mills and Strickland occasionally indulged, is comprehensively set forth.

In the course of Chapters XI to XVI the whole field of essentially modern American architecture is ably analyzed in historical sequence, but with critical insight and happily constructive attitude. Everything from the genesis of skyscrapers to their latest characteristics, and from the ideals of Louis H. Sullivan and Frank Lloyd Wright to the most recent exploits of the ultra-modernists, is discussed with a broad and tolerant outlook. The never-ending stream of architectural creation is depicted with such lively movement that the reader cannot fail to perceive the vitality of the whole subject. Furthermore, the author has interwoven the narrative with appropriate reference to social and economic conditions,—the only way in which the story of architecture can be really intelligible. The book is a contribution toward the popularizing of architectural consciousness. It should stimulate a wholesome lay point of view.

AMERICAN ARCHITECTURE. By Fiske Kimball. 262 pp., 5½ x 8½ inches. Price $4. Bobbs-Merrill Company, Indianapolis.

An Authoritative Work on

"THE GREEK REVIVAL"

By HOWARD MAJOR

THE search for effective types of architecture for domestic use led logically to the re-discovery of the style known as the "Greek Revival." In the hands of a few particularly skillful architects it is being used with marked success, their use being based largely upon study of such examples as have survived the period, just prior to the Civil War, when use of the type was widespread throughout the United States. It is an entirely American style, founded not upon a following of current English architecture but upon a study by Americans of classic types adapted to domestic uses.

Mr. Major's excellent work is the result of a careful study of the style as it was interpreted in the North and East, and particularly in the South. The illustrations of exteriors and interiors are full of suggestions for anyone seeking a variety of architecture bold, simple and effective, which supplies a fitting background for life in America. The book is richly illustrated, and shows existing work, large as well as small, in both city and country

236 Pages; 7⅛x10¾ inches. Price $15

ROGERS & MANSON COMPANY
383 MADISON AVENUE, NEW YORK

MAJORCAN HOUSES AND GARDENS. By Arthur Byne and Mildred Stapley. Text and 188 plates, 12x16 ins. Price $25. William Helburn, Inc. New York.

MAJORCA is the largest of the Balearic Isles, a group in the Mediterranean which lie off the coast of Spain, due south of Barcelona by one overnight journey, and about the same distance east of Valencia. Lying off the beaten path of commerce, these islands form a little world of their own, a Spanish possession, but not wholly Spanish; other influences are apparent here. In their remoteness and isolation they have seen the rise and fall of many civilizations dating back to Phœnician times,—Greek, Roman, Visigoth, Moorish, Italian, Renaissance on through the florescent Baroque period; and each of them has left its imprint. No small island in the world is richer than Majorca in tradition and romance. The architect has only recently rediscovered it, and he finds in its sun-drenched buildings, its churches and convents, its palaces, its country and city dwellings, a vast treasure house for study. Here is architecture unmistakably Spanish, and yet distinguished by a certain subtle quality found nowhere in Spain proper. Here builders were frankly eclectic, borrowing from all civilizations to make a fusion of Mediterranean types, from which he who would build for sunny climes today, anywhere in the world, may draw many practical suggestions.

This work, "Majorcan Houses and Gardens," is a de luxe volume compiled by Arthur Byne and Mildred Stapley of the Hispanic Society of America. It includes 188 large and beautiful plates produced from photographs made by Mr. Byne of the interiors and exteriors of the most notable country estates on the island, and some of the homes, once palaces, in its principal city, Palma. Some of the most important he has amplified with architectural drawings, a few of which are in color. The text, which is less conspicuous than the illustrations, comprises a brief history of the island, an account of its architectural treasures, and a group of explanatory notes on the more important illustrations. The country houses shown are more numerous than the buildings in towns. Their situations are interesting. Instead of dominating the landscapes, they seem to nestle into them in a fashion suggestive of old buildings in England. The hill-top homes, of which there are many, are not set literally on the mountain tops, but half way up, snuggling under their shadows. This gives them protection from the sun, which shines pitilessly and unhindered on Majorca for six months of the year, and in older days it offered protection from the feudal tribes which fought for supremacy, as well as from the hordes of Barbary pirates which once overran the island. In fact, the defensive character of the buildings is conspicuous. Many have fortified towers with lookout drawbridges and moats, and all entrances are carefully hooded. But no matter how sequestered the site, some vantage point was found to command a view of the Mediterranean. Builders proved themselves artists in the clever way they placed their houses to combine shelter with pleasant outlook.

To build the approaches to these hill-top houses often cost more in time and money than to build the houses themselves. It might be the work of a generation. It meant cutting steps in the mountain sides and reclaiming barren slopes with an untiring patience at which the

modern builder marvels. Steps were corbeled out from the faces of rocks to facilitate quick ascent or descent from level to level. The immediate approaches to the houses are usually marked by broad green terraces, the earth for which often had to be carried from great distances and in sufficient quantities for growing orange or olive trees and tropical vines. On the opposite side of a house the second story would open on a terrace, which led to a formal garden. It was here the family lived and enjoyed the view. The stone walls on the island never fail to impress the visitor. Those about Esporlas, on the west side, are particularly fine. Esporlas has always been famed for its walls, so much so that the word *esporlero* is synonymous with "mason." Here the reticulated walls by the roadside or up the terraced mountains are laid with consummate skill,—dimensioned units by thousands, laid up dry and fitted with untiring accuracy. Being laid up dry, and porous,they are never stuccoed but possess a certain rugged architectural character.

The obtaining of a water supply was always a problem with which the architect must wrestle, for Majorca has no great rivers, and streams or *torrentes* are all too few. On the hilly side of the island, water is conveyed by great conduits from a high-lying reservoir. On the plains every estate has its cistern. The architect will notice that every house is surrounded by a balustrated platform, which is in reality a great water-shed, inclining to the underground cistern, a huge vaulted chamber lined with cement, where water is carefully collected during the wet season, to be stored away against the dry months.

Majorca, like the mainland of Spain, adheres to the hollow square plan of building, with the resultant patio, the keynote of all Mediterranean architecture. But the Majorcan patio has little in common with that of Andalusia. It is not an outdoor living room with chairs and other furniture, nor is it made gay with potted plants. In country houses it serves a strictly utilitarian purpose,—it is the focus of the farm life. Here is the great kitchen chimney, the stone table where the servants eat, the mounting block, the shelter for the farm carts. From here an outdoor stone stairway, made practical by the mild climate, leads to the master's quarters on the second floor at the garden side of the house. In the country this stair is of the claustral type, clinging to one wall of the patio in a single run, supported either on solid masonry or on a light graceful arch, with an iron balustrade. Here it joins the upstairs loggia, whose roof is supported by Gothic pillars, from which open the sleeping and living rooms of the family. In city houses the patio is treated architecturally, concentrating on the stair and its loggia. The moment the architect enters the patio he is impressed with the builder's superior knowledge and technique of vaulting. Arches are of great span and very flat, seeming hardly to have key enough to uphold the weight imposed on them, and the intersections of these flat, elliptical arches in connection with the stairs are treated with consummate skill. In the palaces in Palma one finds the typical low Palma column supporting the built-over portion of the patio. From two to four heavy arches, vaulted in Gothic style with groined edges, may converge on one of these columns,—a huge haunch block cut from a single piece. The entrance to the patio shows the eclectic methods of the builders. A vast wooden door, studded with nails or

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ornamented with iron reminiscent of the Moors, may be set in a portal of rose marble in Baroque design. And inside the patio, vaulted in Gothic arches, one may find a Florentine fountain whose waters cool the floor.

The architect may learn much of uses of polychrome from these old Majorcan masters. The delicate colors which exist today have withstood centuries of exposure to sun and rain. A favorite combination is stucco in ocher wash with faded blue or green shutters. All openings are carefully shaded for protection against the sun, and often they are embellished by "scoring,"—the embedding of small stones in the stucco while still wet.

THE MODERN ENGLISH GARDEN. With Introduction by E. M. Cox. 192 pp., almost wholly of illustrations. 8½ x 11 ins. Price $8.50. Charles Scribners Sons, New York.

THE charm of the English garden has been the result of centuries of growth. So widespread was its fame during the palmy days of the French monarchy that English gardners were summoned to France to aid in creating the splendid settings with which the great French architects were surrounding the abodes of the Kings of France. In England itself there were laid out during the spacious days of the later Stuarts and all the Georges those vast gardens which even today are found belonging to great country houses and which bear testimony to the skill of the English gardener. At the opposite end of the scale there have always been those far more modest gardens of which the motorist catches occasional glimpses today,—a small or even tiny area between the highway and some old cottage, or else between a modern cottage and the roadway, an area which creates an appearance of privacy and which also creates the appearance of there being space where very little area really exists.

But for the home owner of the middle class, for the man midway between the cottager and the owner of a vast estate, the Englishman's instinct for creating gardens seemed for long to be dormant if not extinct. Its awakening or resuscitation has come as one result of the widespread use of the motor car, by using which the city worker may dwell in the distant suburbs or else in the real country and yet surround himself with all the delights of country living,—including the delights of an English garden. This brought about long ago a revival of English rural domestic architecture, and this work dealing with the modern English garden proves that the revival of architecture has been attended by equal progress in the revival of the beauty of the small or medium-sized garden, and countless examples are shown.

This volume presents, largely in the form of illustrations, a review of this progress. No one of the many gardens illustrated is of much more than average size, and most of them are of distinctly modest extent. Almost all the examples show what is one of the most charming features of an English garden,—the close relation which exists between garden and house, making the garden almost literally part of the home and not a remote and isolated detail. Part of the volume deals (also in illustrations) with such subdivisions of the subject as rock and water gardens, and the treatment of walls, steps, walks and paths, and with the handling of problems where different ground levels are involved.

The Practical Book of Tapestry

By George Leland Hunter

THE intimate connection between tapestry and architecture as well as the frequent use of architectural motifs in tapestry design gives to tapestry and its history an interest to architects which is strong. Primarily associated with the Gothic age, which saw what were perhaps the most brilliant of its triumphs, tapestry has been identified with the development of all of western Europe and with the different periods —the Renaissance, early and late; the Baroque age; the eras of the different Louis; and in later days with the various places where looms have been set up and where present-day workers are engaged in creating by use of old-time methods those marvelous weaves which add to any surroundings where they are placed a richness of decoration which confers dignity and splendor to the place where they are used. No study is more absorbing than that of tapestry.

IN this volume is given a complete review of the subject of tapestry. The author has made a deep study of tapestry's history and is familiar with every important example in the world. The volume deals also with the technique of tapestry weaving, the changes and development of its design in different countries at different times, and it goes at length into descriptions of modern looms where this ancient art has been successfully revived. The illustrations, many in full color, add to the reader's interest. All are from photographs made especially for this work, and many show the student for the first time examples of tapestry weaving of the first importance. The volume is particularly valuable by reason of its accurate documentation and full bibliography and because of its giving the names of places where there are to be seen the most important tapestries now in existence.

Richly illustrated in half-tone and full color. 302 pages; 6½ x 8¾ inches. Price $10.

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THE EDITOR'S FORUM

THE SULLIVAN MEMORIAL

LOUIS H. SULLIVAN lies in Graceland Cemetery without tombstone or marker of any kind. It has been proposed that the architects of Chicago erect a monument that will suitably mark his grave and be a memorial to his genius. For this purpose a joint committee has been appointed from the North Shore Architects' Association (from which the suggestion came initially), from the Chicago Chapter of the Institute, from the Illinois Society of Architects, from the landscape architects, from the building industry and from the laity. This committee, not knowing the amount available, has made no definite design for the memorial except to determine that it shall be of granite and in the decorative style so expressive of his philosophy and associated with his memory. It will also be carved with some account of Sullivan's life, some brief record of his achievements, and some suggestion of his influence.

In the three years that have passed since Sullivan's death, his fame has constantly grown. Architecture since the World War has entered upon a new era, and has begun to express itself in forms and speak with a language moulded more nearly to the heart of America. To this new destiny Sullivan, with the zeal of the prophet and the courage of the adventurer, pointed the way. By his architectural works, great in scope and power; by his drawings, unsurpassed in beauty and originality; by his writings, rich in poetry and truth; by his teaching, persuasive and eloquent; and by his philosophy, where in three words, "Form follows Function," he summed up all truth in art, Sullivan earned his place as one of the greatest architectural forces in America. Thomas E. Tallmadge, 160 North LaSalle Street, Chicago, is the chairman of the committee.

GOVERNMENT BUILDING IN PARIS

A BUILDING to house the offices of the American government in Paris is to be erected on the site of the premises occupied by the "Union Artistique" Club, on the Place de la Concorde, the purchase of which is announced in dispatches from the French capital. The new building will house the offices of the 15 American government agencies in Paris, including the embassy and the consular services. The structure is to harmonize architecturally with its surroundings and will be built of French limestone.

The government expects to carry out the original plan for a building on this site prepared by the great French architect, Ange-Jacques Gabriel, who, in the reign of Louis XV was responsible for the monumental symmetry of the construction of the Place de la Concorde as we see it today. Such a building as the government now has in mind would correspond with the architecture of the Hotel Florentine, the present residence of Edward Rothschild, located at the corner of the Rue de Rivoli and the Rue Florentine, and would balance the two larger structures of the Ministry of Marine and the Hotel Crillon, in accordance with the original Gabriel design and plan.

TOWN PLANNING IN CANADA

WITHIN the last few weeks two Canadian cities, Quebec and Ottawa, have enacted statutes governing town planning. The Quebec commission is "given full power to replan those parts of the city that have suffered from haphazard development, or from what the *Journal of the Town Planning Institute of Canada* characterizes as 'building anarchy'; and to create a comprehensive plan for future development with the exercise of necessary zoning powers." Editorializing, the *Journal* says that the trend of thinking in a city rich in historical tradition, as Quebec is, might naturally be toward extreme conservatism. The development and passage of so progressive a law are attributed to a definite reaction against bad manners in building which have become established practice during the past few years: "It has come to pass because the more public spirited citizens of Quebec have become disgusted with the building anarchy which, on the plea that business is business, denied the right to existence of historic places in their natural setting, and disfigured the whole city with new structures flung up anywhere and everywhere in barbarous disregard of architectural amenity and the rights of the community."

Within two weeks after the passing of the Quebec act, the city of Ottawa, it is reported, applied for and received the right to exercise architectural control over certain proposed new developments. The new Alberta town planning act has clauses authorizing a permanent provincial town planning board, one duty of which shall be to "assist and advise any rural authority in devising ways and means of preserving the natural beauty of the locality and ensuring that new buildings and erections therein shall be so designed and located as not to mar the amenities of the locality." It takes definite cognizance of buildings located on any highway to which the act applies, making regulations as to their design, regulation, and construction. In Great Britain, several cities, notably Edinburgh and Bath, interpreted the clause in the Town Planning Act which gives power to a local authority to prescribe the "character" of buildings, to mean community control over the design of buildings as well as their suitability to their locations.

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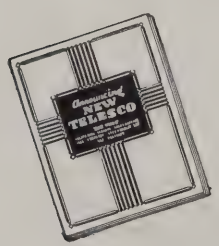

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THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER TWO

AUGUST 1928

THE ARCHITECTURE OF DENMARK: PART I

BY
DR. TYGE HVASS

TO properly understand and judge modern Danish architecture, it is necessary to know something of the country's historical background and something of the character of the country. Denmark is a land surrounded by water and made up of rolling hills, which never attain a height of more than 500 feet. The coast line is irregular, cut by deep bays and fjords. It is a land of farms, and its smiling fields are wreathed by woods, which form a living frame for golden corn fields. As early as the year 1000 the country was densely populated, and of some 1600 country churches now existing, no fewer than 1100 are of mediæval origin and bear the impress of Romanesque architecture.

Scattered about the country the great landed proprietors,—the later nobility,—built their manor houses and castles. Altogether, about 1000 of these manor houses are to be found today. They are located in the most beautiful scenic spots, surrounded by moats, and set in splendid parks framed by wreaths of lake and woods. In the decades from 1550 to 1600, the period of the great baronial lords, most of these manors underwent renovation and modernization in accordance with the tastes and requirements of that age. The nobility imported a number of Dutch architects to supervise their building, and manor after manor was made over in the so-called Dutch Renaissance style, with heavy, massive brick walls, and copper-covered roofs. But even though the buildings were constructed under the supervision of Dutch architects, their character is unmistakably Danish. The materials and the craftsmanship were Danish, and the arrangement of the buildings determined by considerations of place and of the needs of the people. This remarkable period of building, which, so to say, transformed the aspect of the whole countryside in the course of a generation, culminated in one of the most beautiful Renaissance buildings in Europe,—Kronborg, Hamlet's castle, which mirrors itself in the waters of Oresund, at Copenhagen's entrance.

When the Danish peasants secured their freedom

Photo. Courtesy American Scandinavian Foundation

Town Hall Square, Copenhagen

COPENHAGEN

Photos. Sigurd Fischer

OLD ROOFS, COPENHAGEN

RURAL DENMARK

COUNTRY HOUSE, COPENHAGEN
TH. HJEJLE & N. ROSENKJAER, ARCHITECTS

LOVENHOLM MANSION, DENMARK

Photos. Courtesy American Scandinavian Foundation

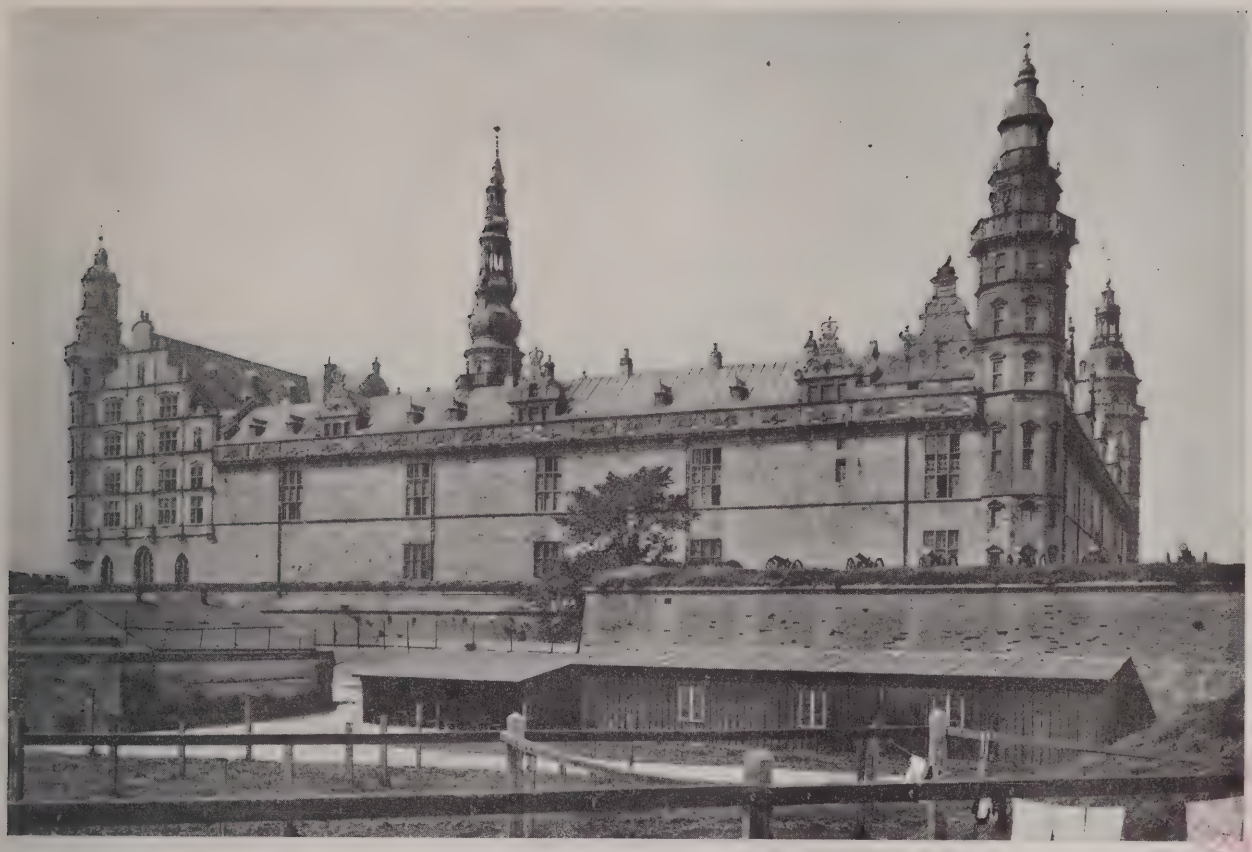
VILLESTRUP MANSION, DENMARK

FRYDENDAL MANSION, DENMARK

RUDBJERGGAARD MANSION, LOLLAND, DENMARK

BRAHETROLLEBORG MANSION, DENMARK

GYLDENSTEN MANSION, DENMARK



KRONBORG CASTLE, ELSINORE

HOLMSGAARD MANSION, DENMARK

they moved their homes out from the villages and built them on their own farms. These houses were usually erected in quadrangular groups; opposite the main building stood the barn, and at the center, across from the entrance to the main building, was a large gateway. The main buildings and the barns were connected at both ends by stables, facing the outside of the square yards. These houses were, as a rule, built of half-timber construction, and the roofs were thatched with straw. This attractive building plan has held its own down to the present time, and though the peasants have modernized their farm-houses, and the half-timber has been supplanted by brick and the thatch roofs by tile, they have retained the main features of the original buildings. In the towns the rising middle classes built their homes with the same materials of half-timber and tile, and many of the houses bear traces of motifs borrowed from the castles of the great nobility. Many of these patrician houses are still to be found here and there.

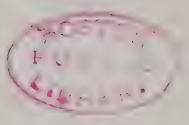
Of all the Danish monarchs, Christian IV was the greatest builder, and to his love for splendid structures we owe an impressive series of castles and public buildings which must be numbered among the finest architectural monuments of their age. We mention here merely the famous Round Tower of Copenhagen, the Copenhagen Exchange, and Rosenborg and Frederiksborg Castles. In 1730 the Royal Academy of Arts was established, and French artists were imported to be its first directors. Among these, the architect Jardin, who came to Denmark directly from Italy, must be accounted the most notable. He supervised the construction of a number of public buildings which compare favorably with the finest examples of architecture elsewhere in Europe. His buildings exemplify the best of eighteenth century French architecture, tempered by Nordic moderation, and without the French Baroque extravagance. they possess a simplicity of line and a quiet strength which mark them as characteristically Scandinavian.

Hesselagergard Mansion, Denmark

Photos. Sigurd Fischer

THE MARBLE BRIDGE, COPENHAGEN

ONE OF THE TWO PAVILIONS THAT FORM THE ENTRANCE TO THE ROYAL LIBRARY, COPENHAGEN



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COLONNADE AT AMALIENBORG CASTLE, COPENHAGEN
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TOWN HALL SQUARE, COPENHAGEN

ENTRANCE GATE, KONGENS HAVE, COPENHAGEN

PETER LIP'S HOUSE IN DYRCHAVEN, COPENHAGEN
A POPULAR INN SINCE THE BEGINNING OF THE EIGHTEENTH CENTURY. THE ORIGINAL FORESTER'S HOUSE WAS BURNED IN 1915 AND REBUILT A YEAR LATER

THE TOWN HOUSE OF WILLIAM ZIEGLER, JR., ESQ.

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

BY

MATLACK PRICE

TO every discerning architect must come the time when he discovers that architecture is not satisfying if it fails to go beyond mere correctness,—correctness, that is, which has to do with the accuracy with which he has transcribed this or that moulding. Scholarly carefulness, no matter how fine, comes to seem inadequate. Imagination is not involved, or good taste,—and of these two all true architecture is found, in the end, to be compounded. Because this is so, imagination and good taste often make up most of the difference between really distinguished architectural performance and that which may be good but quite undistinguished. It may even be unfortunate that good taste is often a gift rather than an acquisition. If it could be easily acquired, we might see more of it,—but as things are, it is in no danger of becoming commonplace. All of which prefaces a few words regarding a recently built house designed by William Lawrence Bottomley, an architect whose work I have always felt to be marked by essentially good taste. The Ziegler town house is definitely American in its major characteristics, with a certain cosmopolitan urbanity in the whole manner of its rendering. Of brick exterior, with paneled shutters and a fine Georgian doorway, the broad entrance foyer at once bespeaks a definite American lineage. The cornice derives from the old Congress Hall cornice of Philadelphia, and two stone Ionic columns suggest something that Jefferson might have done in the Classic manner of Monticello. The built-in paintings are French, of the early eighteenth century, by Forbin, entirely in character with the sort of thing which might have been brought over in Revolutionary times for the adornment of the fine house of a gentleman of taste and means. Beyond the circular stair well, which runs the entire four

Entrance Hall, House of William Ziegler, Jr., Esq., New York

William Lawrence Bottomley, Architect

OWNER'S BEDROOM

GUEST ROOM BATH ON THIRD FLOOR

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

LIVING ROOM TERRACE ON SECOND FLOOR
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

flights to the top of the house, there is a beautifully done "powder room," much in the manner of the Empire without being too insistently stylized. Spacious closets are built behind concealed doors painted by Mrs. Joseph B. Thomas in the manner of old *grisaille* wallpaper, with a panorama of very early New York. Here the utmost smartness and sophistication have been achieved wholly without affectation.

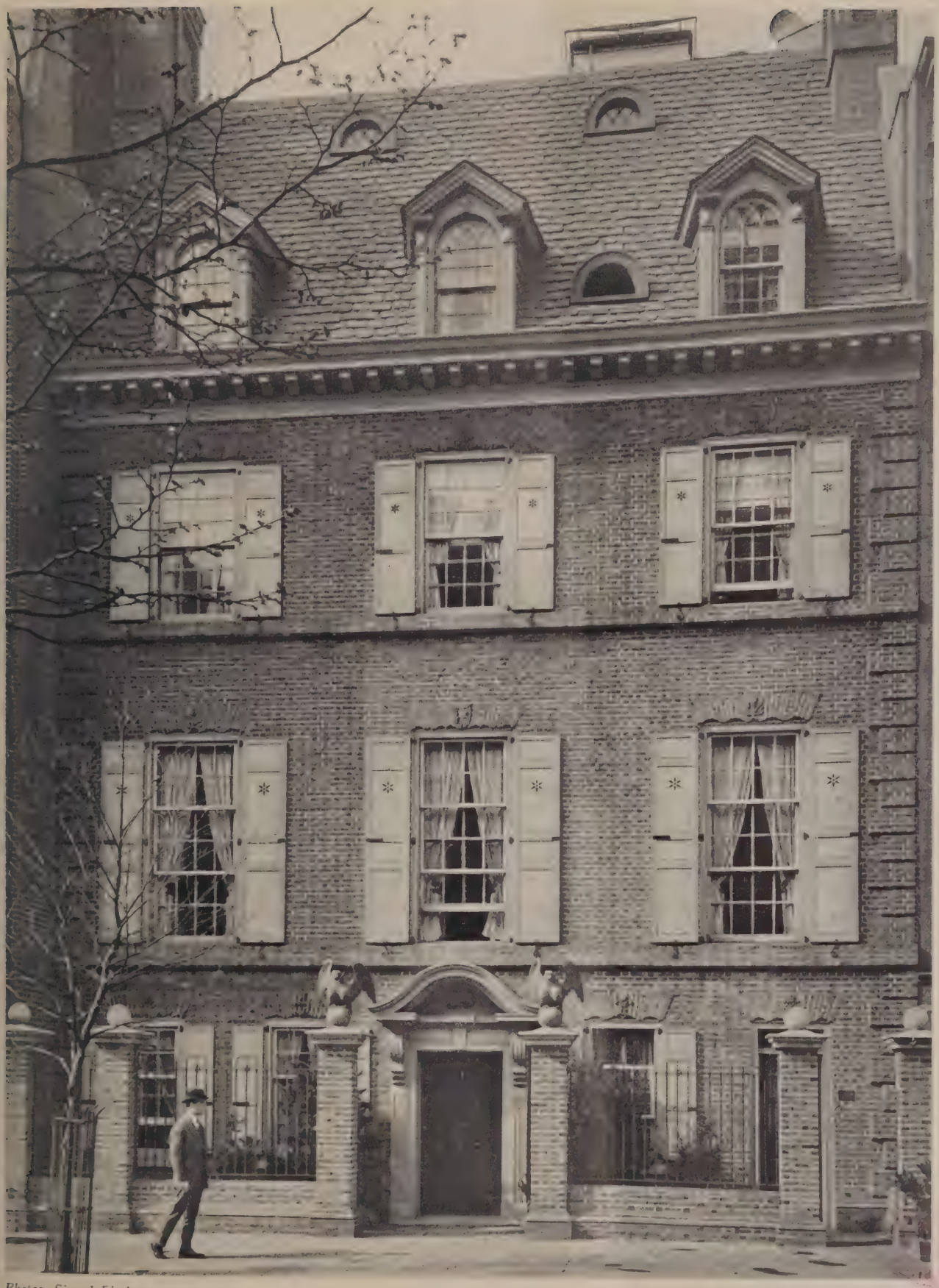
Au premier etage. The hall gives toward the front of the house into the dining room, and toward the rear into the sitting room. The dining room is long and dignified, faithfully detailed from the old Beekman house. Mr. Bottomley had impressions made of the mouldings and other ornamental details, and these are executed in a manner thoroughly in accord with the feeling of the original work. Here is a dining room that is a serious and significant addition, like Grosvenor Atterbury's work in the New York City Hall, to the best of our re-creations of Georgian Colonial and early American interiors. In the large sitting room there is a full realization of the opportunity for fine spaciousness that is afforded by the wide city plot on which the house is built. The room is an old deal room from England, an original, astoundingly like, in detail, to the Beekman interior on which the dining room was based, being, in fact, an architectural contemporary. It is a handsome room, a fit setting for its fine paintings, such as a landscape by Gainsborough. Architectural ingenuity has further provided concealed incidents which would surprise the original designer of the room. One door, for instance, conceals a complete lavatory in old Dutch tiles; another reveals a complete radio equipment, and small panels, when opened give access to winches for lowering the great Waterford glass chandeliers, so that they may be cleaned without mounting tall step-ladders. The sitting room windows open upon a pebbled terrace with a fountain, and as this terrace is laid out on an extension of the service quarters below, it looks down, in turn, upon the garden that occupies the remaining portion of the premises and toward the facades of other houses.

Dressing Room on First Floor

The third floor is given over to charmingly furnished guest rooms, with faultlessly appointed baths and dressing rooms, in every detail of which ingenuity is combined with good taste. One realizes at this point, how the good taste that pervades the whole house has kept any one room or any stylistic mannerism from being insistent or over-architectural, and is reminded, perhaps, of the definition of the really well dressed man, of whose apparel every detail is in such good taste that one cannot remember, at first thought, exactly what he was wearing. The fourth floor, by choice, is occupied by the owner's apartment, with charmingly designed dressing rooms and baths. Concealed closets with trays and hanging space are ample,—and are invariably planned with unobtrusive ingenuity. Every comfort or convenience caters to pleasant living in a charming environment. Can any architect, by any possible means, accomplish more?

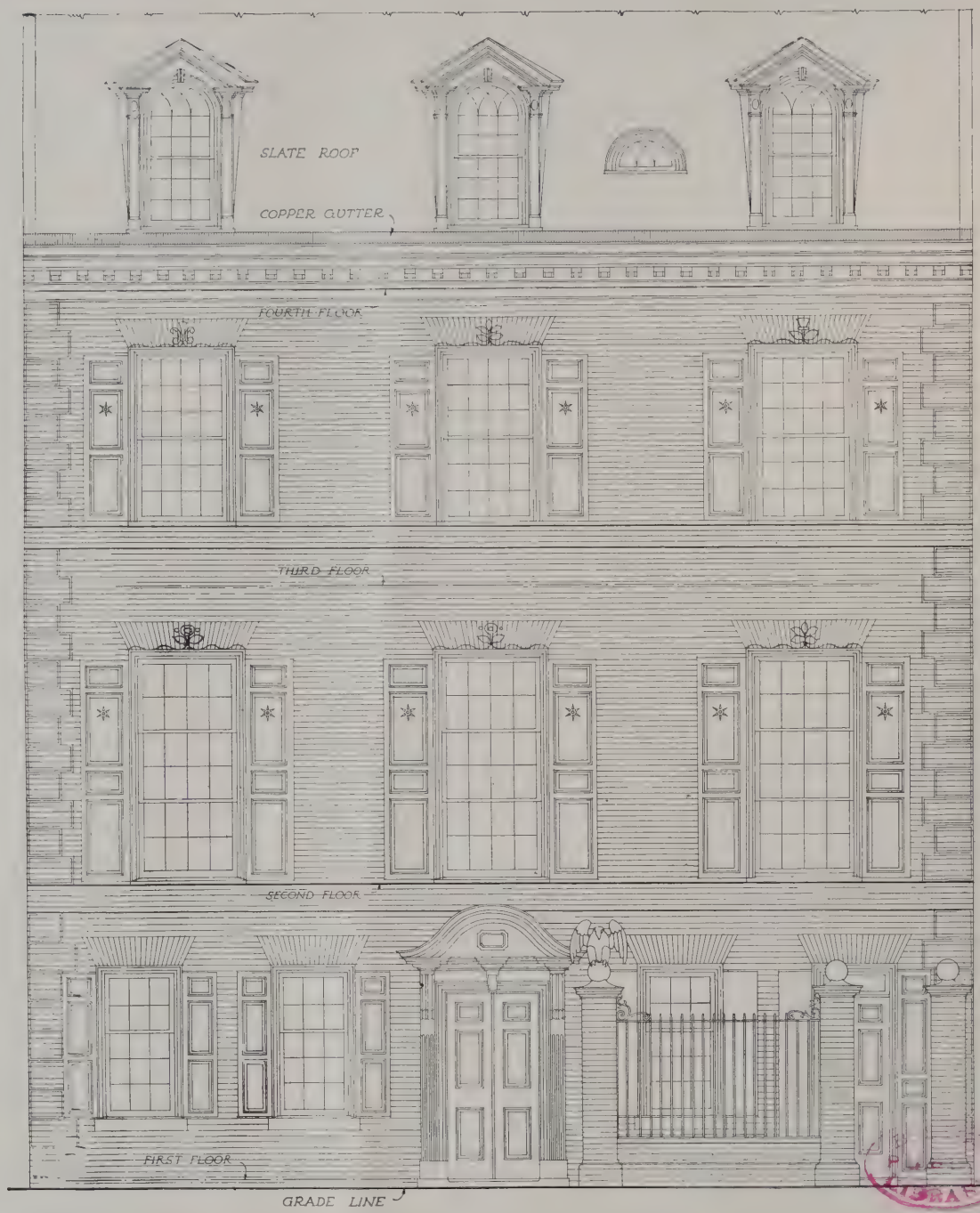
The details of interior decoration were carried out by Mrs. Cameron Tiffany, in collaboration with Mr. Bottomley. Everyone who is at all familiar with Mr. Bottomley's work must think of him as, himself, a decorator of peculiarly marked abilities as evidenced in his invariable combination of knowledge and good taste. There is never anything unstudied or unfinished in his work.

Editor's Note. In these days when so many of the younger architects are spurning and discarding all use of precedent in their designs, it is both gratifying and reassuring to find one of our foremost younger architects using Georgian precedent with such complete success. Although purely English Renaissance in every detail, this house of Mr. Ziegler's shows unusual originality and inspiration. It is a perfect example of the way architectural precedent should be studied and adapted to modern requirements. Particularly is it true in domestic architecture that designs carried out under the influence of the modernistic school are deplorably lacking in those qualities which make for liveableness, charm, satisfaction, and the all-important quality of hospitality, which, for the past two centuries, have been characteristic of the finest domestic architecture in England, France and America. To most of us, the bizarre, grotesque and ascetically rectangular interior architecture and furnishings of the modernistic house are distressing.



Photos. Sigurd Fischer *Detail on Back*

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



FRONT ELEVATION

0 5 10 15 20 25

SCALE IN FEET

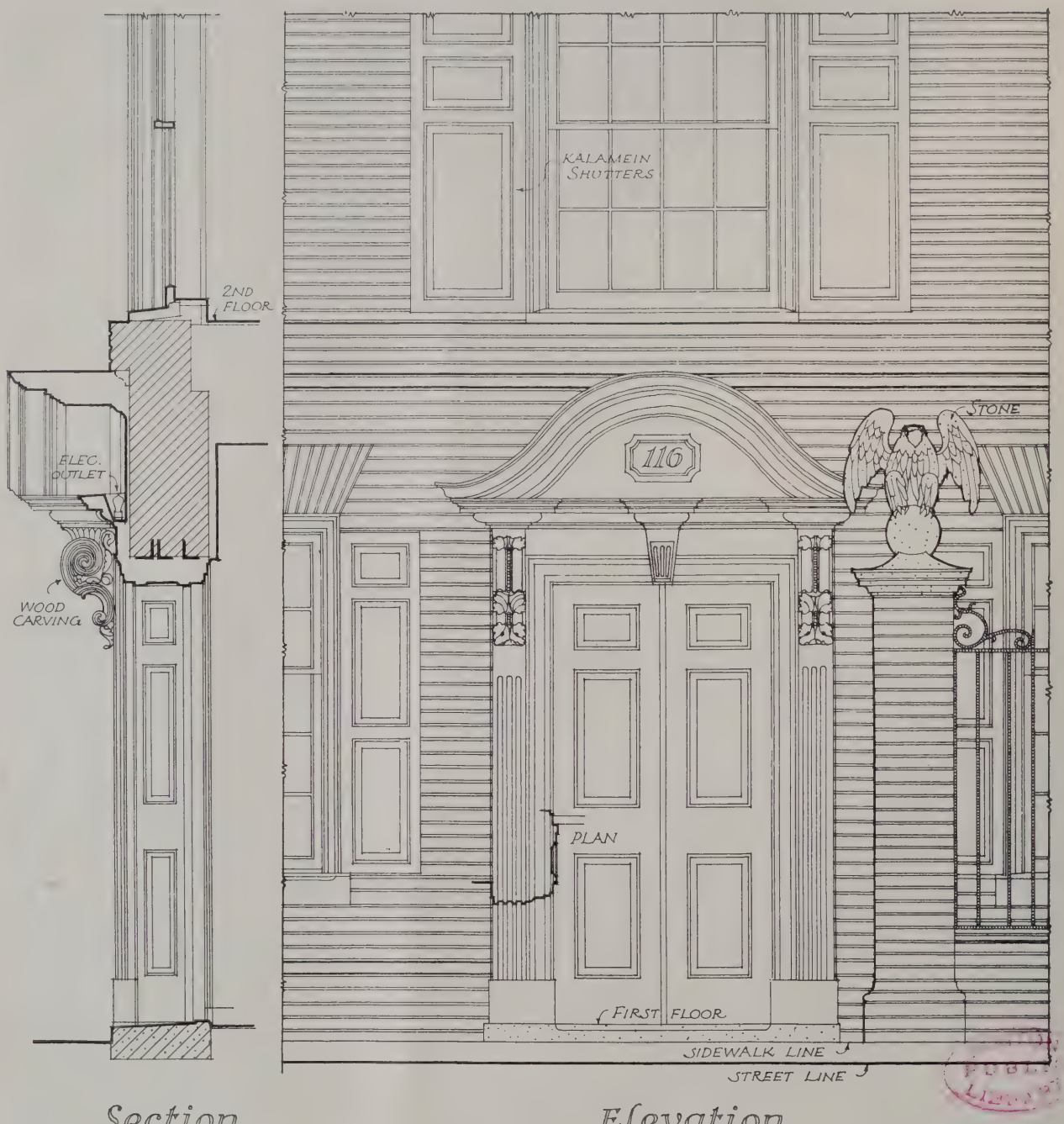
AUG. 1928

DETAIL. HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

No. 75

Detail on Back

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



Section Elevation

ENTRANCE DETAIL

SCALE IN FEET

1 0 5 10

AUG 1928

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

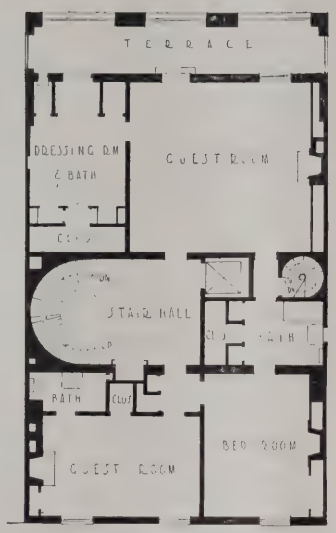
No. 76

Plans on Back

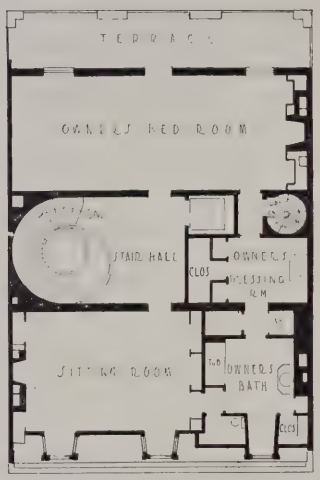
LIBRARY

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



SECOND FLOOR



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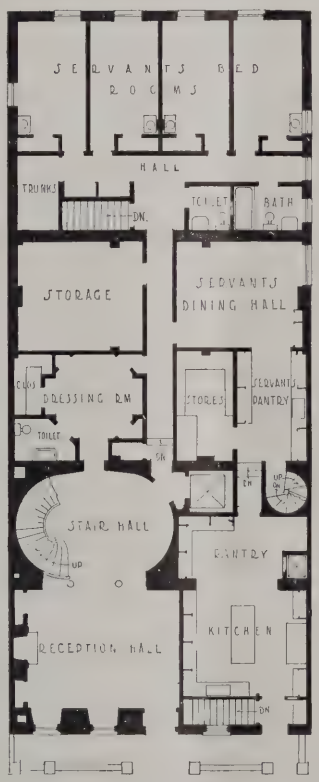

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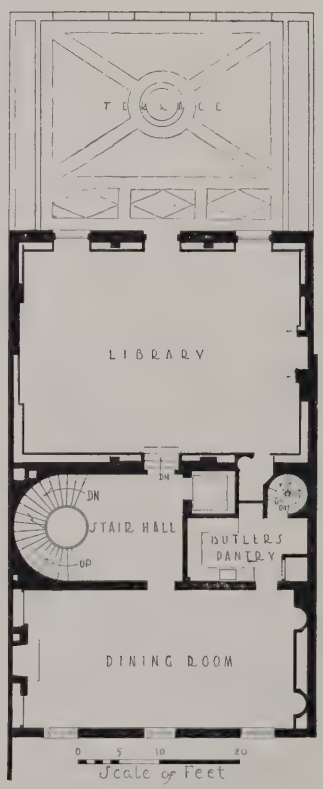


FIRST FLOOR

PLANS. HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

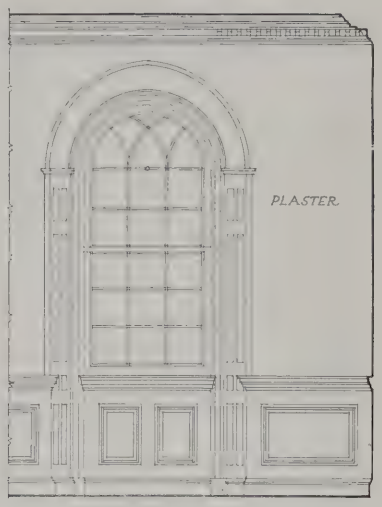
LIBRARY
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

Details on Back

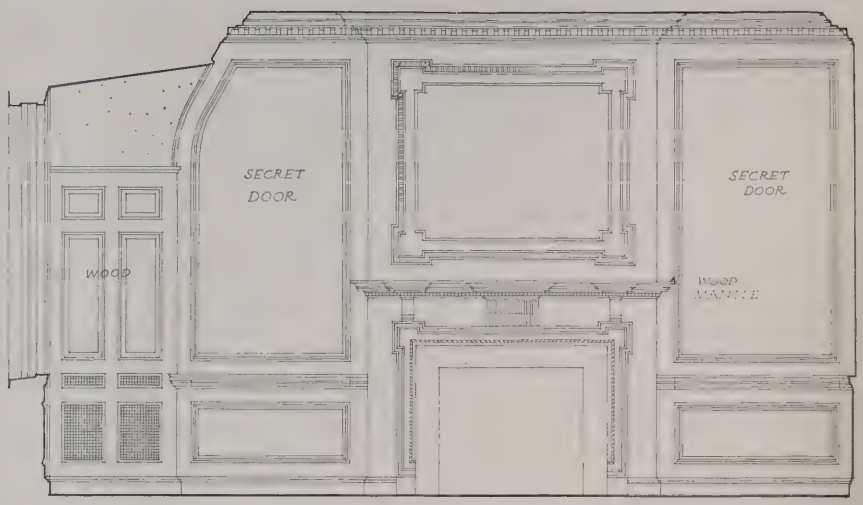
SITTING ROOM

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



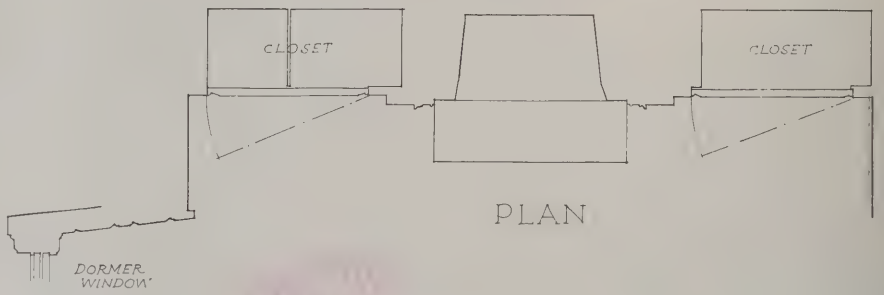
PART OF
SIDE ELEVATION



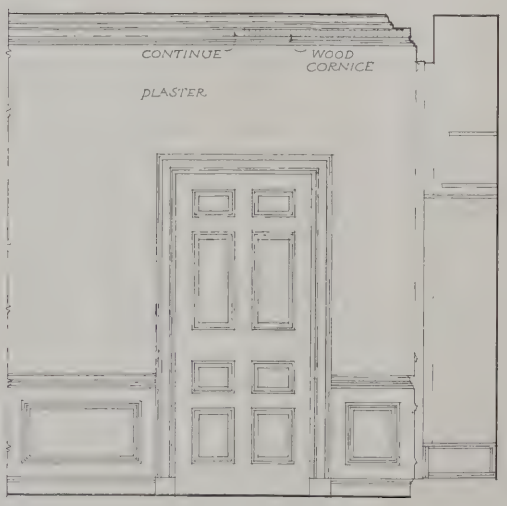
FIREPLACE ELEVATION

SITTING ROOM DETAILS

FOURTH FLOOR



PLAN



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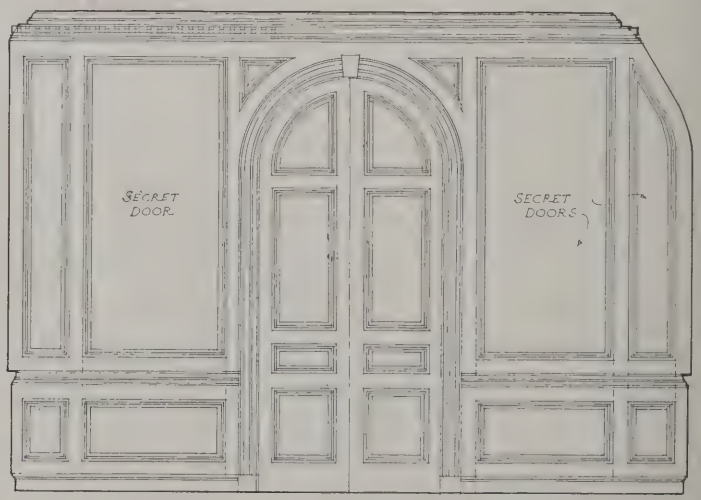


ELEVATION OPPOSITE FIREPLACE

AUG
1928

1 0 5 10 15

SCALE IN FEET

No.
77

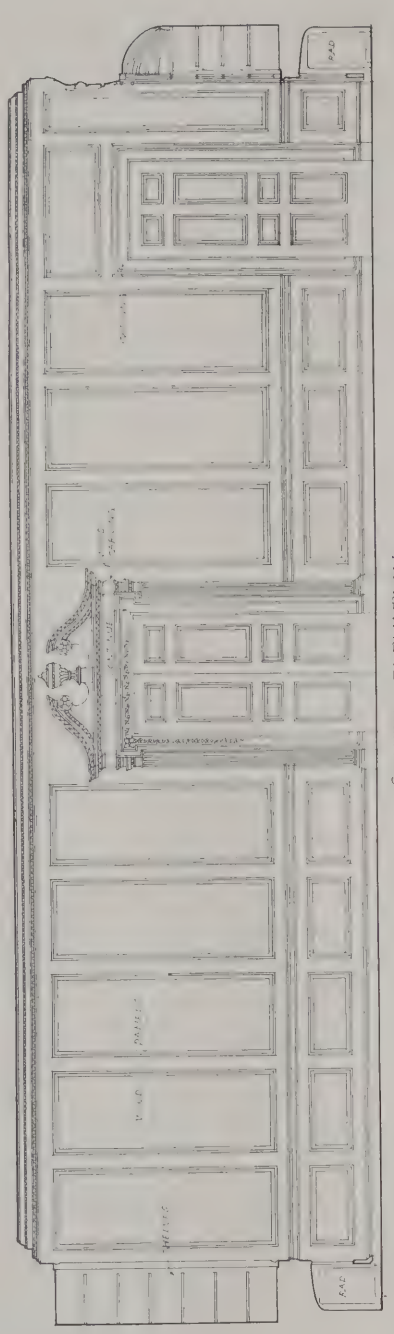
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

Details on Back

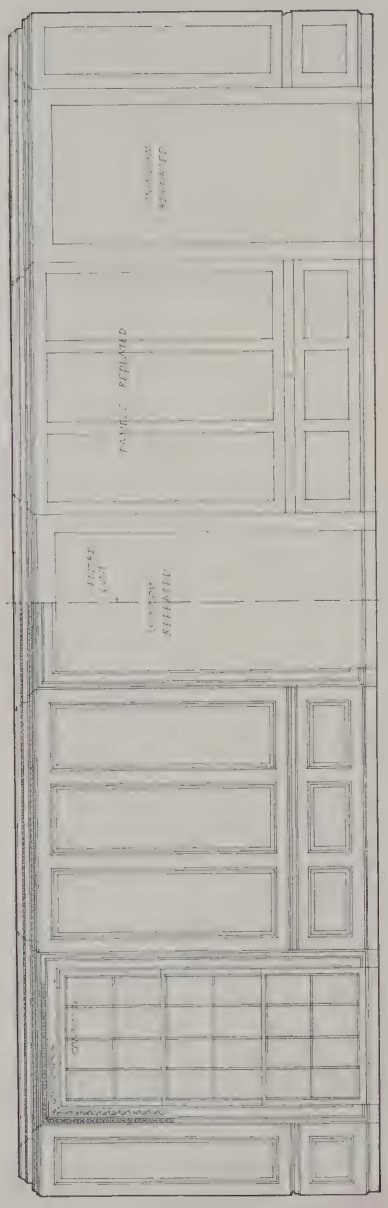
DINING ROOM

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

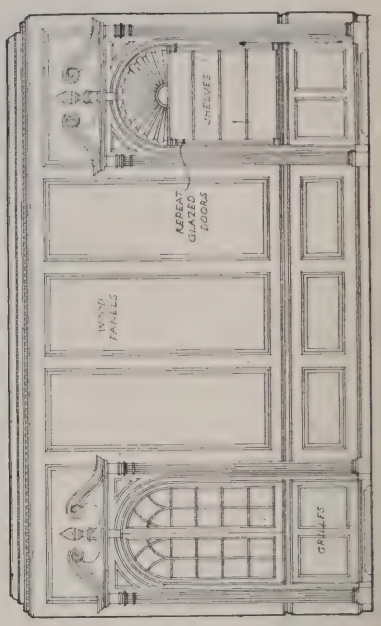
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



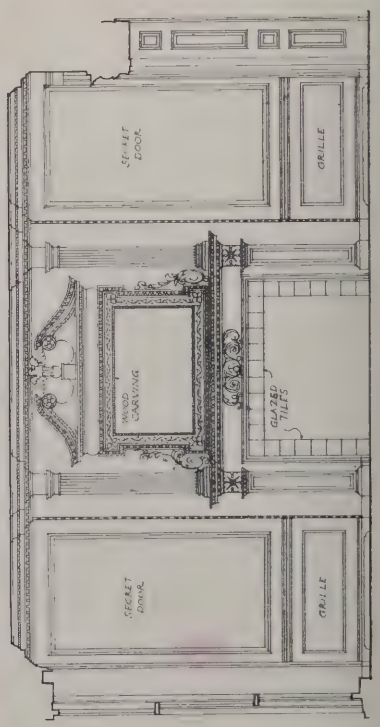
SOUTH ELEVATION



NORTH ELEVATION



WEST WALL



EAST WALL

DINING ROOM DETAILS

AUG. 1928

0 5 10 15 20

SCALE IN FEET

No. 78

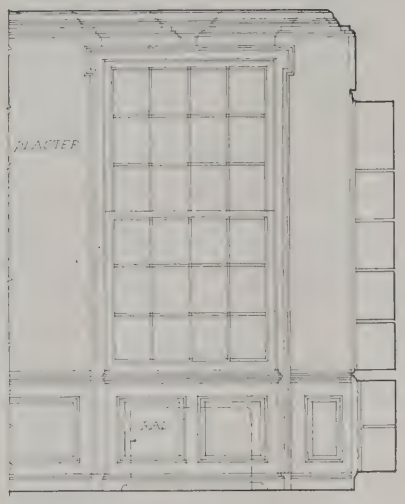
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK

WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

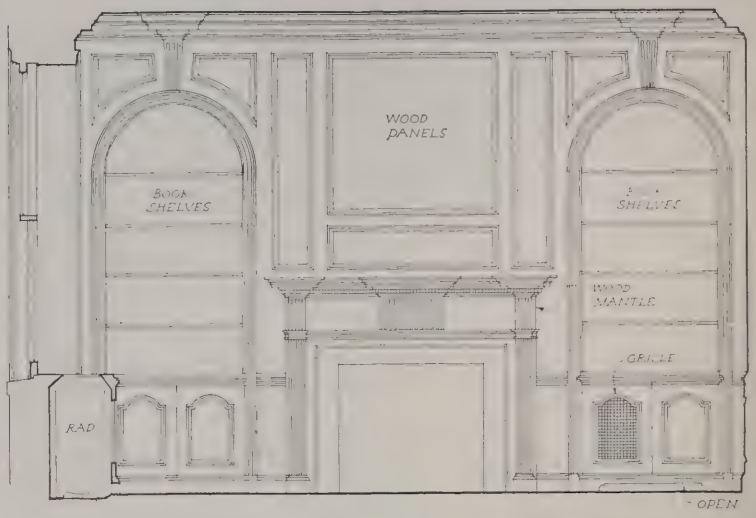
Details on Back

OWNER'S BEDROOM

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

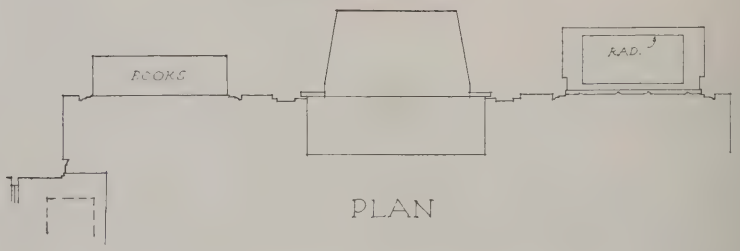


PART OF
SIDE ELEVATION

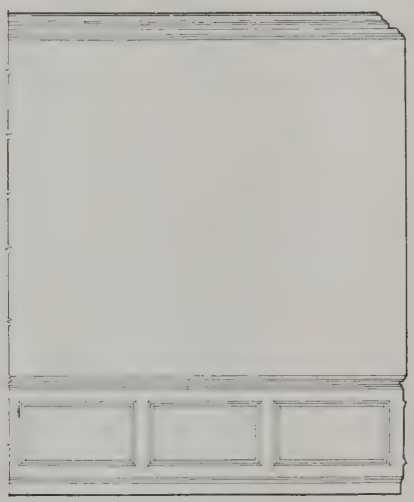


FIREPLACE ELEVATION

DETAILS of OWNER'S BED ROOM



PLAN



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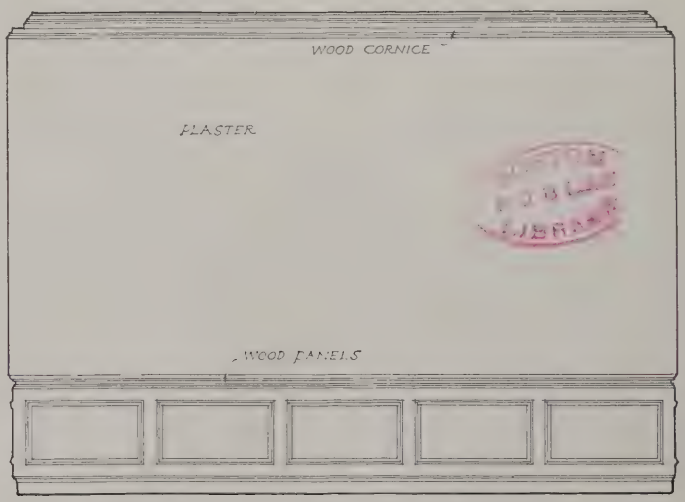


END ELEVATION

SCALE OF FEET

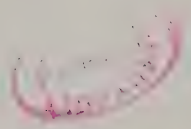
1 0 5 10 15

AUG. 1928

HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT

No. 79

HALL ON SECOND FLOOR
HOUSE OF WILLIAM ZIEGLER, JR., ESQ., NEW YORK
WILLIAM LAWRENCE BOTTOMLEY, ARCHITECT



THE FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT

BY

OTTO F. LANGMANN

REGARDLESS of whether it be faith, reason or circumstance that induces man to accept his religion, there is still the subtle matter of setting or "atmosphere" to be reckoned with in his selection, and it is the architect's privilege, as well as his difficult problem to supply this intangible and evasive thing, usually with forms and materials that are familiar, for in churches, above all else, our art bids us be conservative, using only what might be proper.

Knowing success to be dependent directly neither upon size or proportions nor richness of materials and yet, on the other hand, being uncertain as to its contributing causes, the architect welcomes with joy an opportunity such as was afforded in the case of the First Baptist Church at Plainfield, N. J. With its walled flower garden and willow and pine trees, the plot itself had so much charm that the success of any architectural composition to be placed upon it seemed reasonably assured. The history of this church is so interesting that it is worth while recording some of the salient facts. The earliest Baptists of this community worshiped in a meeting house at Scotch Plains, built in 1742. From it came men who in 1792 founded Samptown Church, two miles south of Plainfield, and from this, in turn, sprang the First Baptist Church at Plainfield. At the time of its organization, it had 34 members, and its pastor, the Reverend Jacob Fitz Randolph, drew the munificent salary of $250 per annum. Considering that the town of Plainfield at this time numbered 250 inhabitants, this represented an expenditure of exactly one dollar per person in the cause of religion. It would be interesting to know the cost of building in those days, but unfortunately the record of whatever assessment was made of its 250 citizens is not preserved. The original meeting house was a plain rectangular frame building, without spire or other marks to distinguish it as a place of worship. Later on, however, there were added such elements, first a bay at the rear, in 1837, and then a portico with square columns and a cupola in 1843. As the size and wealth of the congregation increased, the building became too small and modest in appointments and so, in 1868, it was moved to the rear of the lot while a new edifice was erected of local stone. This building endured, without change, until 1923, when a disastrous fire rendered the congregation homeless.

After considerable deliberation and delay, it was decided to move to a new site, and the residence and garden now incorporated into the "plant" were purchased. Furthermore, those in charge of the new building program instituted a competition among a limited number of architects in the belief that this procedure would insure the best results, and the new church represents the winning design of this competition. The program as written called for the incorporation of the residence on the site into the general scheme, which meant, since Colonial was the style employed, refacing it with a veneer of brick and cutting back the projections of all cornices. The

Photos. Mattie Edwards Hewitt

First Baptist Church, Plainfield, N. J.
Hobart B. Upjohn, Architect

FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

Parsonage, Sunday School and Close, First Baptist Church, Plainfield, N. J.
Hobart B. Upjohn, Architect

finished building testifies to its complete success.

The plan of the group is of U-shape, with the Sunday School at the back, flanked by the church at the right and the church offices at the left. The old encircling brick wall was retained, although it had to be reduced in height so as not to be a menace to traffic. Even in its altered form, however, it contributes to a seclusion that is rare with modern churches. The church, with its slender spire and high nave windows, dominates the design, the Sunday School being low, somewhat in the manner of the dependencies or outbuildings of Colonial residences. The church auditorium is a simple rectangular room, without columns, but with a balcony at the rear and a slightly curved ceiling. The organ is placed on the main axis of the room, in the chancel immediately above the baptistry, while the singers occupy stalls, two on either side of the chancel. The organist is placed in a gallery, behind the choir stalls and within reach of members of the choir to permit the passing of sheet music or notes. By a mandate of the competition, the organ had to be placed back of the pulpit, and it quite dominates the composition with attributary elements of baptistry and chancel furniture. Behind the baptistry are located six robing rooms, to be used at baptismal services, and at the right is a study for the minister for use immediately before and after service. The Sunday School, lying in the wing at right angles to the church, contains the Beginners', Primary, Intermediate, Senior and Young People's departments, consisting of small classrooms and their respective assemblies, and a large room for general assembly called the "Fellowship Hall." Two large fireplaces emphasize the social note of this room, while a stage and projection room allow for dramatic entertainments. A large, well equipped kitchen, capable of preparing meals for 250 people, is adjacent to the Fellowship Hall. The residence formerly on the site has, as was already said, been much altered on the exterior, whereas the interior was only slightly changed to meet the needs of the executive branch of the church organization. The minister's study, women's parlor and various offices, some of which can be also used for meetings of classes on Sunday, are located here, easily accessible from the street; and by virtue of the fact that this was once a residence, the rooms which they occupy are free from any touch of the "institutionalism" which so easily creeps into the design of a regular office building.

As to the decorative color scheme employed throughout the group, this adheres strictly to precedent, in that the woodwork, except for doors of mahogany, is of ivory. The walls, however, are treated in pale colors, varying from blue in the Fellowship Hall to green in the Primary, and from tan in the Beginners' Room to a warm, grayish buff in the church auditorium. Draperies in practically all the rooms, appropriate decorations on the lamp shades, and chairs in the small children's rooms, and the presence of a flower box here and there, together with the light colors of the walls, afford a note of cheerfulness blended with that cleanliness so proverbially akin to Godliness, giving an impression in absolute contrast to that of the gloomy and stuffy churches of an age not so long gone by. Brick, marble and wood are the materials employed in the walls, use being made of a local brick from South River, N. J., closely resembling that used in colonial times. Cornices, pilasters and the spire are of wood.

Photos. Mattie Edwards Hewitt *Plan on Back*

FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT

MAIN FLOOR

PLAN. FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

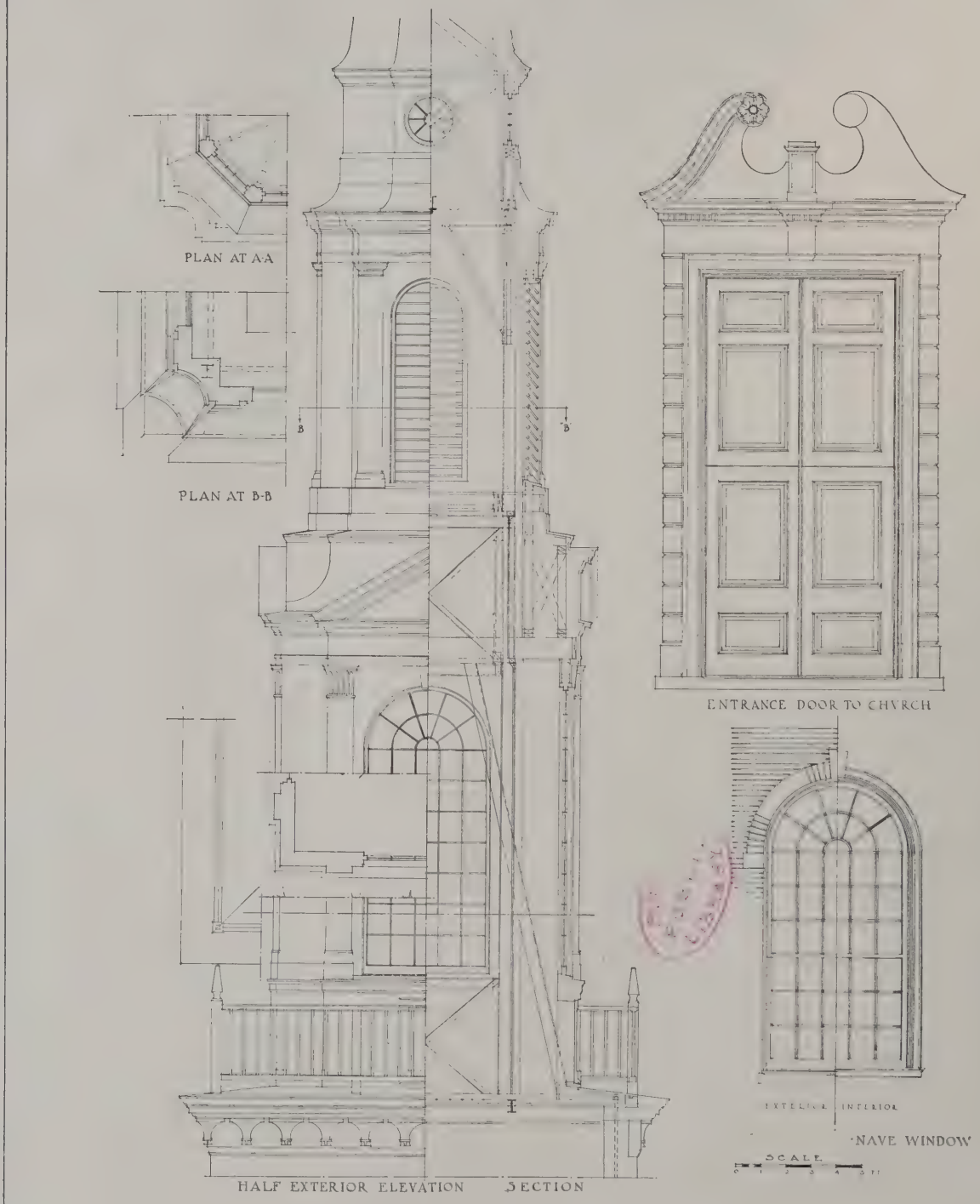
HOBART B. UPJOHN, ARCHITECT

BOSTON PUBLIC

Detail on Back

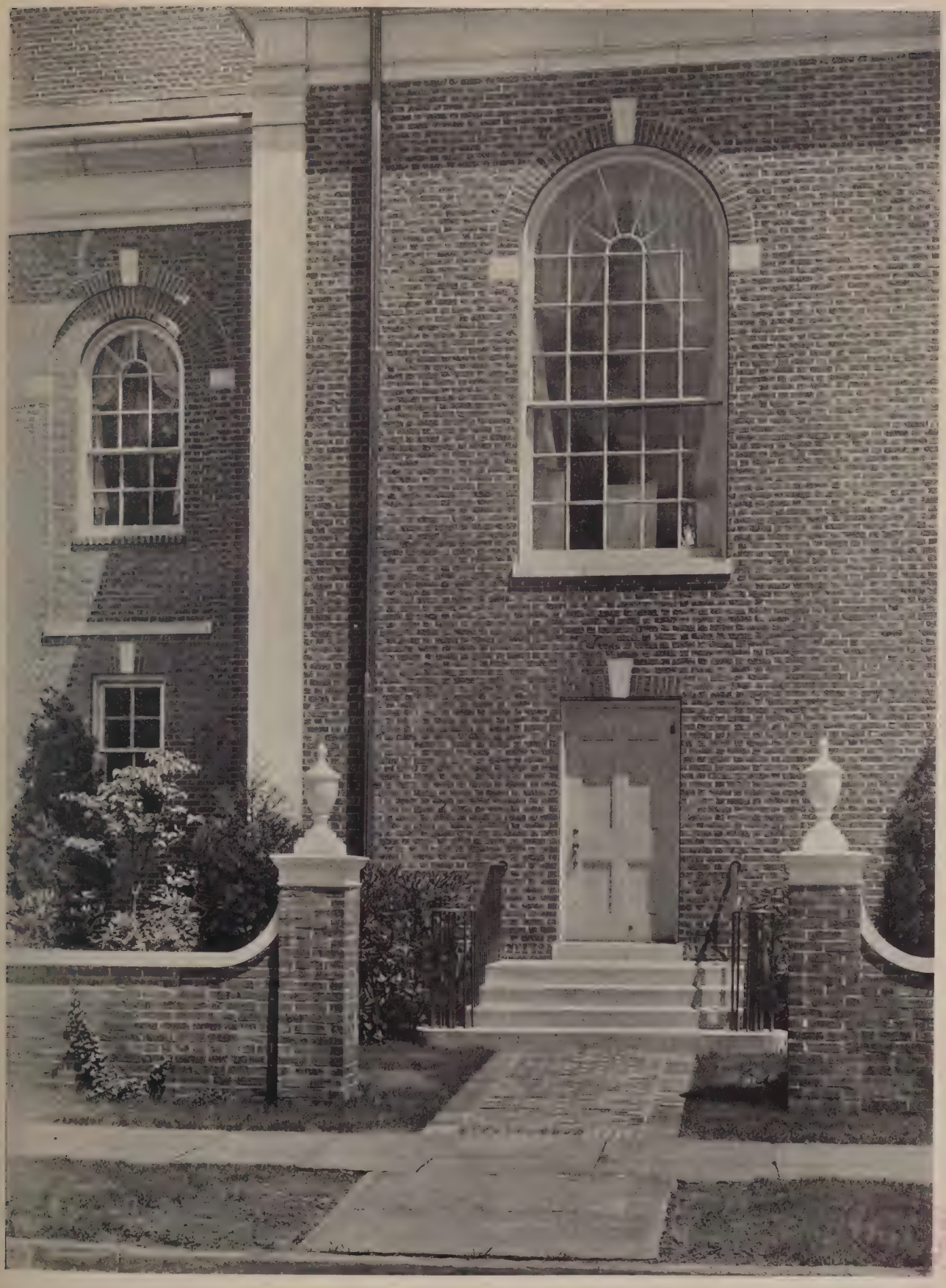
FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT



DETAILS. FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART B. UPJOHN, ARCHITECT



FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

PUBLIC
LIBRARY

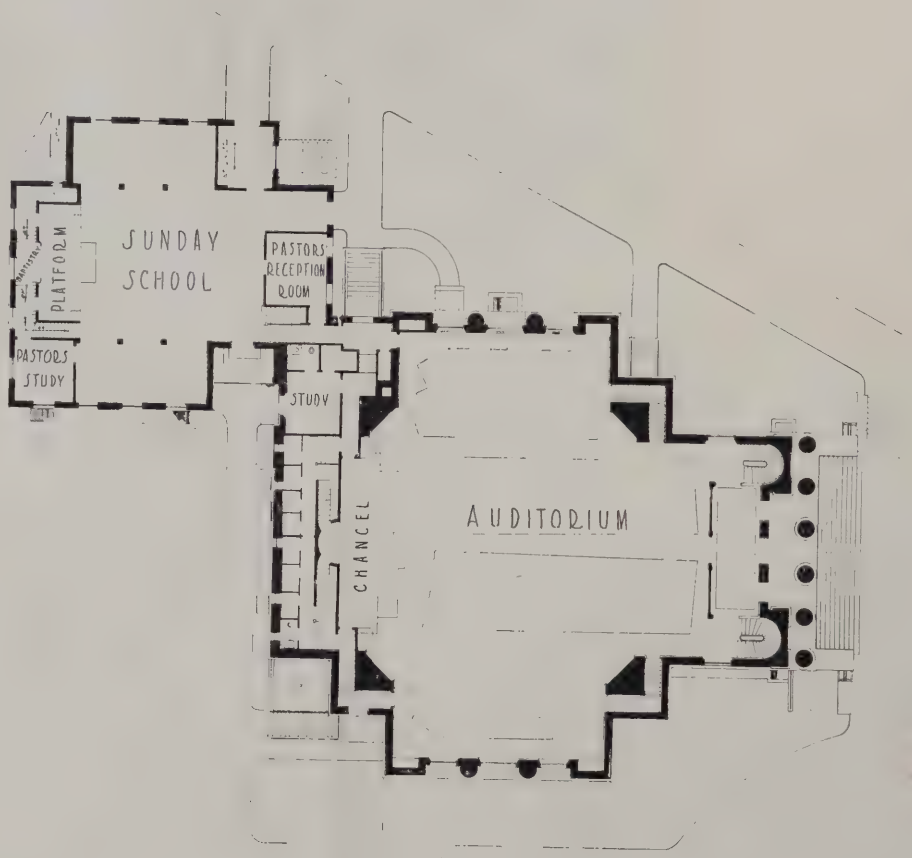
FIRST BAPTIST CHURCH, PLAINFIELD, N. J.
HOBART B. UPJOHN, ARCHITECT

PUBLIC LIBRARY

Photos. John Wallace Gillies, Inc. *Plan on Back*

UNIVERSITY BAPTIST CHURCH, BALTIMORE

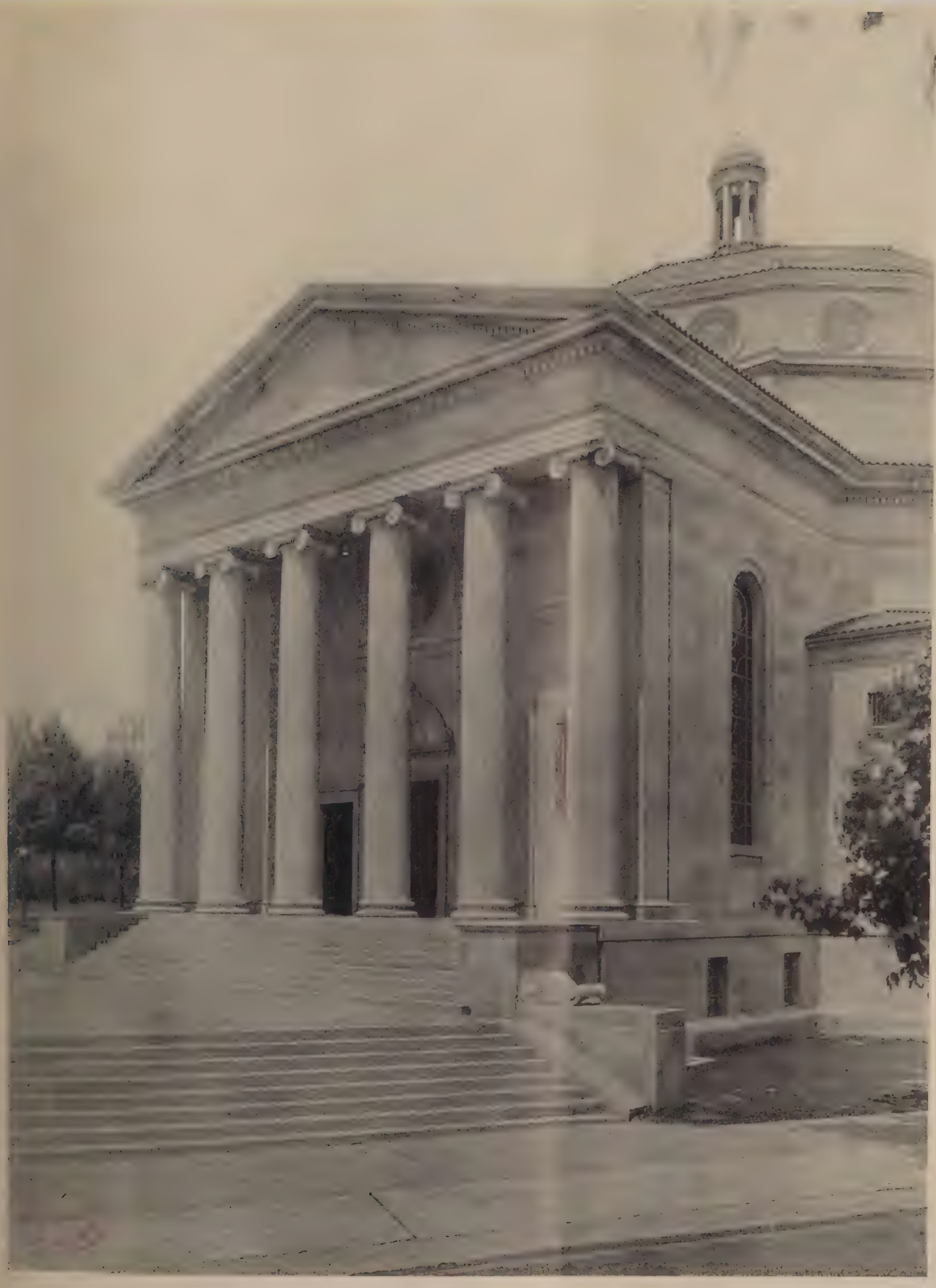
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



MAIN FLOOR

PLAN. UNIVERSITY BAPTIST CHURCH, BALTIMORE

OFFICE OF JOHN RUSSELL POPE, ARCHITECT



UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

BOSTON PUBLIC LIBRARY

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OFFICE OF JOHN RUSSELL POPE, ARCHITECT

UNIVERSITY BAPTIST CHURCH, BALTIMORE
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

SOME DOMESTIC WORK OF BAILLIE SCOTT

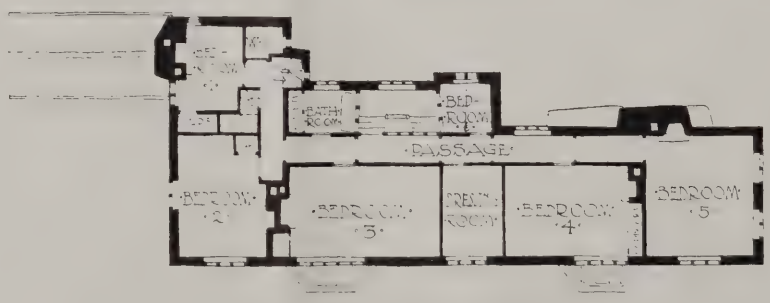
BY
WILLIAM PATTERSON

AMONG those who admire modern domestic English architecture of the more picturesque and romantic school, the name of Baillie Scott is indeed well known. Gifted with much originality of thought and with considerable skill in the matter of design, he has built many English homes, large as well as small, which may well be passed on to coming generations of Englishmen as excellent examples of the best in the way of present-day design and craftsmanship. Mr. Scott's design excels, first of all, in the matter of grouping structures. With a high regard for symmetry and usually for balance, he disposes the masses of his buildings in ways which satisfy one's sense of proportion without involving a formal disposition of similar parts upon either side of an axis. Then, too, he has inherited from earlier British architects that almost unerring instinct for the combining of different architectural elements in ways which seem to be logical and the result of carefully thought out planning, even when, as has frequently happened, the combining has been wholly fortuitous. Then there is the highly important matter of roof lines, Mr. Scott's being long, simple and flowing, giving to a structure the harmony and symmetry of a tree with its low and spreading branches close to the ground. His houses are designed with particular reference to their sites, and thus, for one reason, they possess that strong individuality which is one of the distinguishing marks of his work. So too in the matter of chimneys, for whether they be placed singly or grouped into stacks, they add to the buildings' masses and restful roof lines just that degree of accent which well disposed chimneys should supply, but which often they do not.

In an old country such as England, which has been growing for centuries and which is made up of many counties, towns and hamlets inhabited by people possessing widely different social traditions and methods of building, there persist of course countless architectural types and uses of materials, and these types and uses cling to and are suited to their localities in a particular way. A house which might be admirable in Yorkshire would be quite out of place if built in Surrey or Sussex, just as in much the same way a northern New England Colonial house would be entirely unsuitable in Florida or California. The Yorkshire cottages with their thick stone walls and heavy stone roofing slates, the beautiful old Cotswold houses, and the rich and mellow houses of the southern counties with their wonderful old tile roofs, mellowed and weathered by the hand of time, all give inspiration to the architect who is also an artist. The roofing tiles used in England are much more successful than most of the tiles

"Burton House," Longburton, Sherborne, Dorset
Baillie Scott, Architect

ENTRANCE FRONT



UPPER FLOOR

GROUND FLOOR

"HARBLEDOWN," CANTERBURY, KENT
BAILLIE SCOTT, ARCHITECT

"The Tudors," Gerrards Cross
Baillie Scott & Beresford, Architects

we find in America. Hard, smooth tiles always give a roof a monotonous and stereotyped appearance.

After receiving an invitation from the owner of "The Tudors," Gerrards Cross, Bucks, to visit the place, I was strolling around the district in which the house is built, trying to pick up some worthwhile houses to photograph. I found a good many thorns and only a few roses. Suddenly rounding a corner in a bend in the road there appeared a mass of roof lines which at once suggested Baillie Scott, a house of more than usual distinction, the sort of place one often thinks about and wants to see but seldom finds in actual life. A few moments later the whole entrance front came into view. I felt like a tired traveler arriving at his destination and finding himself suddenly standing in front of a charming old inn, with a feast spread before him. In the late afternoon of a long English summer day, with the gradual approach of twilight and the softening shadows falling over a rolling countryside, there comes an atmosphere of peace, quiet and contentment; I had caught "The Tudors" at its best. In England the early morning, after sunrise, and the fading twilight are the times when the countryside is most appealing. The house, garden, surrounding scenery, and occupants of "The Tudors" all seemed to fit in together and to produce the feeling of a truly old English home with real atmosphere both inside and out, while their personal welcome made me feel that there still exist in England that cordiality and friendliness which one often feels lacking nowadays under more modern ways and methods of living and more modern ways and methods of living and thinking, perhaps more particularly since the World War.

Surrounded by much picturesque country, "The Tudors" is some 18 miles from London,—by express train 25 minutes is the time from Paddington to Gerrards Cross. Two miles away is Old Jordan's Meeting House, a delightful spot, well known to many visitors on this side of the Atlantic, since William Penn is buried there. The entrance porch of "The Tudors" reminds one of some of the old buildings in the southern counties of England, where we see those wonderful old bits of building that make our flesh creep when we think of most of the modern so-called "half-timber effects." There is only one way in which half-timber construction can be successfully carried out, and that is in the good old fashioned European way,—by using plenty of solid timbers and lots of hand labor. Pieces of wood spiked onto a wall, especially on the face of a brick wall, are at best only a fake. An illustration of the entrance porch is shown here, enlarged from a small photograph. The porch is fashioned out of old English oak, of a beautiful color and texture, all hand wrought by craftsmen in the village shop adjoining Old Jordan's. At the time this house was built, there were in the shop where the woodwork

MR. SCOTT'S HOUSE, "OCKHAMS," EDENBRIDGE, KENT
BAILLIE SCOTT & BERESFORD, ARCHITECTS

GROUND FLOOR
"THE TUDORS," GERRARDS CROSS
BAILLIE SCOTT & BERESFORD, ARCHITECTS

DINING ROOM IN MR. SCOTT'S HOUSE, "OCKHAMS," EDENBRIDGE, KENT
BAILLIE SCOTT & BERESFORD, ARCHITECTS

UPPER FLOOR
"THE TUDORS," GERRARDS CROSS
BAILLIE SCOTT & BERESFORD, ARCHITECTS

EAST ELEVATION

WEST ELEVATION

GROUND FLOOR PLAN

ELEVATIONS AND PLAN FOR A VILLAGE CLUB, IWERNE MINSTER
BAILLIE SCOTT, ARCHITECT

· The East ·

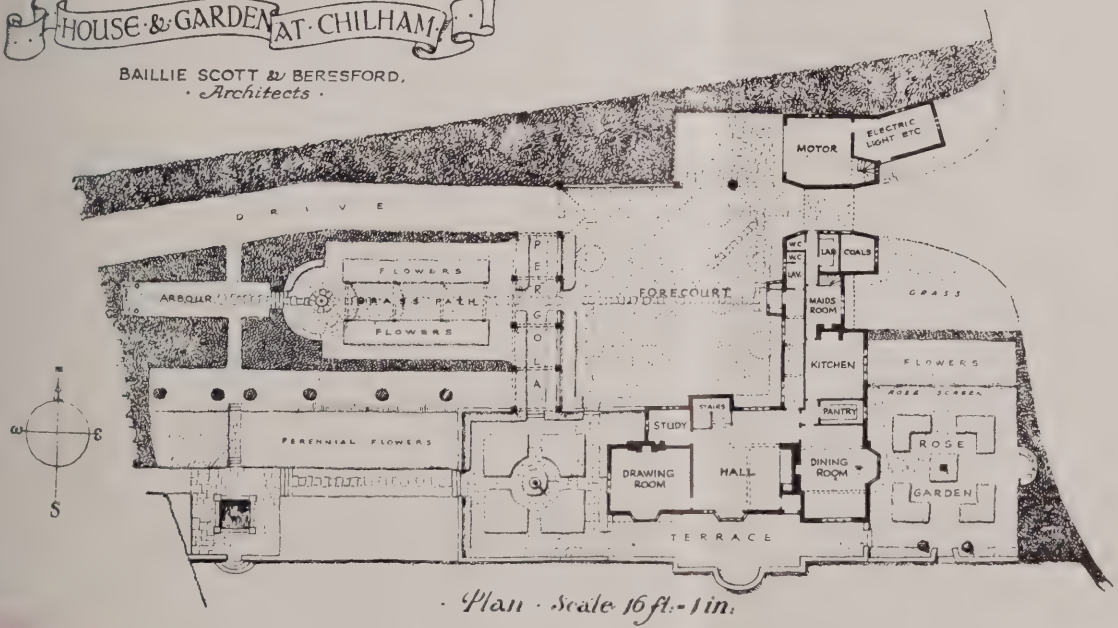
· The West ·

Scale 8 ft. - 1 in.

The South

HOUSE & GARDEN AT CHILHAM

BAILLIE SCOTT & BERESFORD,
· Architects ·



· Plan · Scale 16 ft. - 1 in.

ELEVATIONS AND PLAN OF A COUNTRY HOUSE AT CHILHAM
BAILLIE SCOTT & BERESFORD, ARCHITECTS

was executed some of the old school type of craftsmen, men accustomed to the use of tools now going out of fashion since the introduction of standardized millwork. This type of man is rapidly dying out, and in most places he is dead already. The entrance to "The Tudors" has the appearance of age, and the gable does not look in any way mechanical. Almost all new houses have a painfully raw look; they remind one of the man who is just about to be married, uncomfortable in his usually stiff and formal new clothes. Defects of this sort can only be toned down by the hand of time and by the work of nature; to be successful, construction of this kind must be wrought by skilled hands or it will only look odd. It is merely due to the difference in handling by the artist who knows and the man who *thinks* he knows. Baillie Scott has not relied too much on the T-square, and with him the Old World has supplanted the New. Tiles taken from old buildings add very much to the appearance of the roof of the house. Hand-made, sand-faced brick with wide flush mortar joints add to the general effect, and the half-timber work does not have any appearance of having been touched by machine. The spacing of the timbers is in keeping with old traditions,—a most important point in the successful carrying out of this type of work. The master hands of designer and craftsman are apparent everywhere, both outside and in. It is real mortise and tenon construction, with good fat oak pegs in place of the more modern nail and hanger. A solid, substantial, thoroughly livable and modern house, made to last for many a year to come. Most of the walls of the rooms are framed up with solid chunks of oak, with rough plaster in between where there is no wood paneling, all in the old fashioned way, with numerous heavy beams and uprights moulded on the edges and stop-chamfered. The woodwork inside is in oak of a fine color and texture, with heavy oak doors studded with "W. I." nail heads. The doors have old fashioned wooden latches and bars. "The Tudors" gives one the feeling of living in a bygone age,—in the days when machinery was unknown, when people lived more simple lives, and probably got a good deal more out of life than they do now.

"Harbledown," near Canterbury, in Kent, is a charming example of a modern English country house with the walls built in a typical Kentish style. Intermixed with the local Kentish stone, brickwork is introduced in a skillful way, with a touch of half-timber work as is so often found in this part of England. The ground floor plan is typically English, while the dining room and kitchen arrangements are quite in keeping with American practice. The grouping together of the three main rooms with pergolas at either end gives an ideal arrangement from the point of view of entertaining. The bathroom accommodations, while not meeting with American demands, could easily be enlarged. Bedroom fireplaces add much to the attractiveness of a house of this type and give that feeling of coziness so often found lacking in the modern American residence. As has already been said, chimneys when well designed and skillfully arranged add very much to the appearance of any house, large or small.

Drawn freehand, the elevations of any house are interesting. Mr. Beresford, Baillie Scott's partner, prepared the drawings of their house and garden at Chilham. The elevations are delightfully drawn and give much character to the house. The west elevation is a perfectly charming example of a real country home. The cottages and small houses of Baillie Scott have the same atmosphere and feeling as his larger buildings, and the perspective sketches shown in these pages give the reader a good idea of what he has done to make the small house attractive.

If personal environment and the associations of older times can add anything to the abilities of a designer, surely some of the architects' offices in London ought to help greatly in this respect. Lincoln's Inn and Grey's Inn are about as far removed from the modern new Regent Street as are the older villages and towns of New England from the modern atmosphere of Fifth Avenue. In the former case we are taken back into the days of the stage coach, full of much that was picturesque in more ways than one. It was in Grey's Inn Square that I found Baillie Scott's office, amid surroundings it would be impossible to find in any modern and so-called, up-to-date town.—and some of the modern towns are painfully up to date. Looking out on an old square, with fine lawns and great trees, it seemed an ideal situation in which an artist might work, giving one almost the feeling of working in the country. It seems strange these days to think of men having labored for generations in these old and often historic places, where one would naturally suppose that the atmosphere must affect those who work there now. Some day all these buildings will probably be removed, and in their places we shall have more modern structures, lacking much of the charm of the old in the same way in which the new edition of Regent Street fails utterly to inspire one in the way the former buildings did. On the walls of Baillie Scott's own room are fascinating drawings in color, sketches which one thinks must have "sold" the prospective client again and again. Perspective drawings and small scale elevations, in color, pencil and ink, give one a good idea what can be done in the hands of artists like Baillie Scott and his partner.

It has been possible to illustrate here only a small selection from the large amount of work done by Baillie Scott,—houses built not only in England but in different parts of the world. A facile and original brain has given many charming and imaginative touches to all of Baillie Scott's houses, to be handed down to future generations and treasured by them,—buildings representing the best of present-day work.

THE COMPETITION FOR THE NEW HAVEN CITY HALL

ONE of the most interesting competitions of the past year was that for the New Haven City Hall. Everett V. Meeks, head of the Architectural Department of the Yale School of Fine Arts, who was appointed by the Mayor of New Haven to act as architectural adviser, made all of the arrangements for the competition. In order to give the architects in New Haven an opportunity to compete for this large municipal building and civic auditorium, Mr. Meeks decided to hold preliminary and final competitions. The first competition was open only to architects practicing in New Haven. From this preliminary competition three architects were chosen to be admitted to the final competition, which also included three other well known architectural firms, making six competitors in all. The three New Haven architects selected were Douglas Orr, Harrison Earl Baldwin, and Walter Shiner. With Harrison Earl Baldwin, Paul Philippe Cret, of Philadelphia was associated; and with Walter Shiner, Dennison & Hirons, of New York, were affiliated. The three outside architects invited to compete in the final competition were Egerton Swartwout, Delano & Aldrich, and Zantzinger, Borie & Medary, of Philadelphia. The architects invited by Mr. Meeks to act as the judges of this competition, were Harvey Wiley Corbett and Charles A. Platt, of New York, and William Emerson, Dean of the Architectural School of the Massachusetts Institute of Technology.

This digest of the program, and the final reports of the findings of the judges in the preliminary and final competitions, give an excellent idea of the character and result of this interesting competition. The plot is of irregular shape and level grade. The main frontage, 229 feet long, is on Church Street facing the New Haven Green, which is well covered with large elms. Some 300 feet south, on the same street, and also facing the Green, is the new post office of Tennessee marble with a large 10-column portico. Facing the site and the post office there are two fine old Colonial brick churches on the Green, each with a good sized wooden portico. Facing the Green, to the north are the New Haven Library and the County Court House. The scheme is divided into three units; the first a departmental building on Orange Street, to be built before the other units, containing 600,000 cubic feet. The third is an auditorium on Court Street, with a cubage of 666,666 feet and a seating capacity of 3000. Vehicular access, in addition to that in Court Street was desired. The second, the final complete building, minus units one and three, has a cubage of 1,536,842 feet. This unit contains the aldermanic chamber and two anterooms; the mayor's offices; two city court rooms, civil and criminal; judges' chambers and consultation rooms for each, with prisoners' pen on the criminal side with connection by stairs with the police lockup; probate court and dependencies; city attorney, clerk of courts, jury room, stenographers' room, etc., the court room dependencies to be so located that direct access to the court rooms can be had without crossing public thoroughfares; quarters, 26,750 square feet, for the police department, with access by driveway to the street; space for the health department, 19,000 square feet, on or near the ground floor, with separate entrance facilities; three hearing rooms and anterooms, 7,500 square feet each; rooms for the board of education, fire department, etc.

Drawings required:

Three elevations at 1/16 scale.

Two plans, main and second floor, of entire scheme at 1/32.

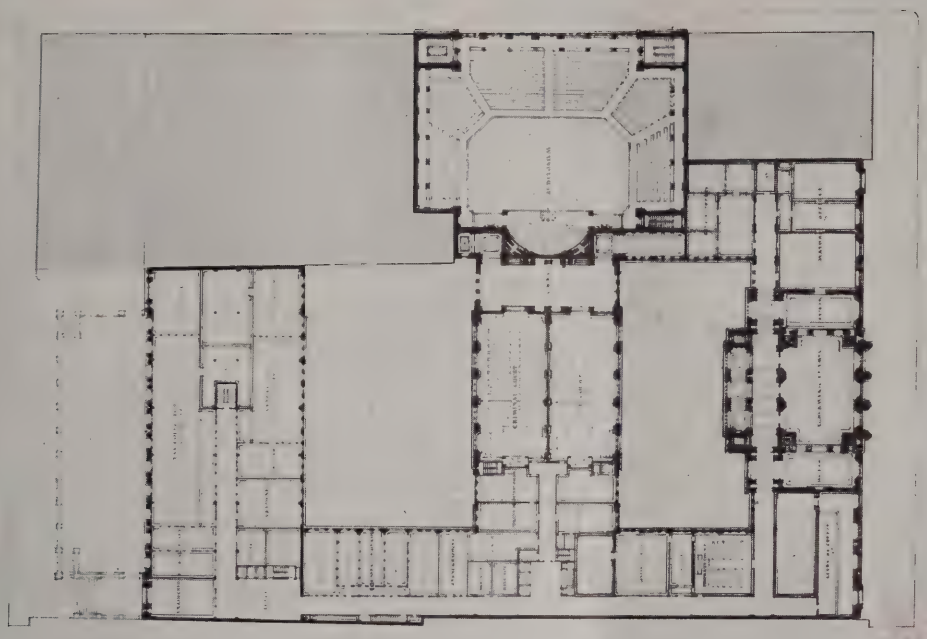
Complete plans of first unit at 1/16.

Two sections at 1/16.

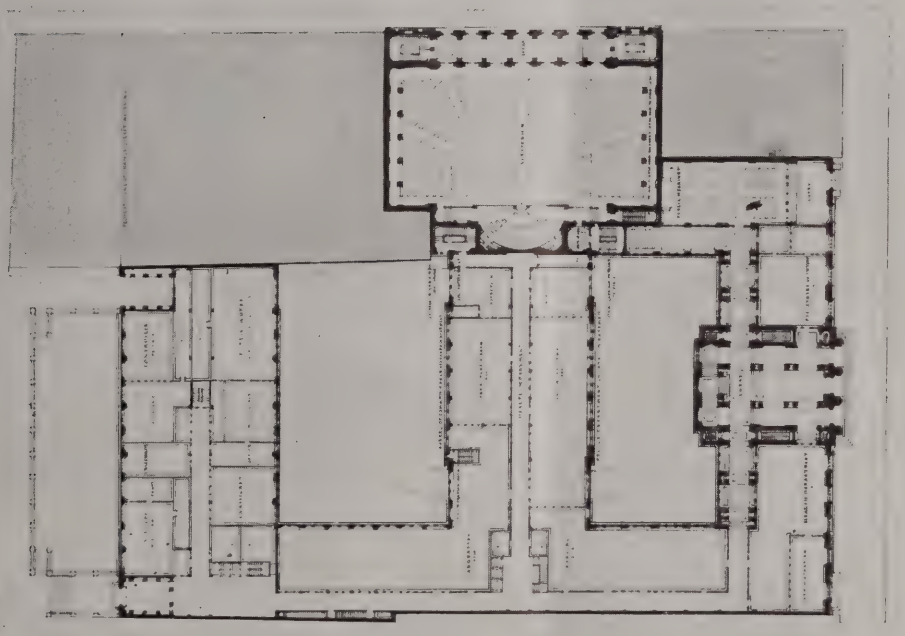
First Report of Competition. "The Architectural Jury of Selection for the Competition of the Proposed City Hall for New Haven met on April 19, 1928, and made first a thorough examination of the site, studying the relation of the plot to the Green and to the adjacent streets. The Jury then began a careful study and comparison of the designs submitted, starting by assembling all the general plans, analyzing each with reference to such considerations as light and circulation, distribution of departments, etc. As a result of this study a preliminary rating was determined. Then the facades and typical floor plan and section of each competitor were brought back and compared with his general plan layout. All the plans showed a high grade of excellence in scheme and presentation, but there were features in each which afforded a decided basis of comparison; and a final rating, after exhaustive study from all angles, was unanimously agreed upon by the Jury. From this rating, the Jury selected the makers of three designs in the order rated, as those competitors to be chosen to enter the second and final stage of the competition."

Final Report of Competition. "As a result of study, one plan seemed to comply more fully than the others with all the essential factors of the problem and was given a preliminary rating, but before final decision the facades and typical floor plan and section of each competitor were brought back and compared with his general plan layout. After continued study of all the plans, it was finally decided unanimously that the Jury recommend to the New Haven City Hall Building Commission that the design marked No. 1, which was submitted by Egerton Swartwout of New York, be the premiated design." The efficient and eminently satisfactory manner in which this competition was handled by Mr. Meeks, of the Yale Architectural School, emphasizes anew the advisability of placing charge of any important competition in the hands of an experienced architect who shall act as architectural adviser.

WINNING DESIGN IN THE NEW HAVEN CITY HALL COMPETITION
EGERTON SWARTWOUT, ARCHITECT

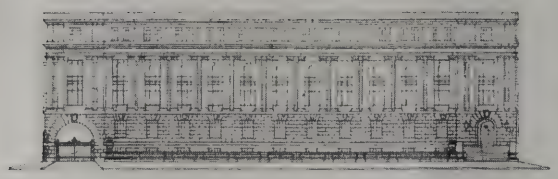


SECOND FLOOR PLAN

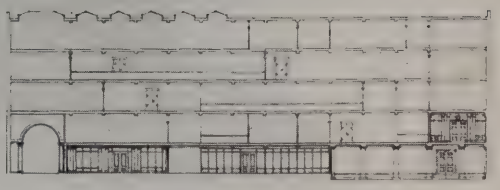


MAIN FLOOR PLAN

THE WINNING DESIGN IN THE NEW HAVEN CITY HALL COMPETITION
EGERTON SWARTWOUT, ARCHITECT



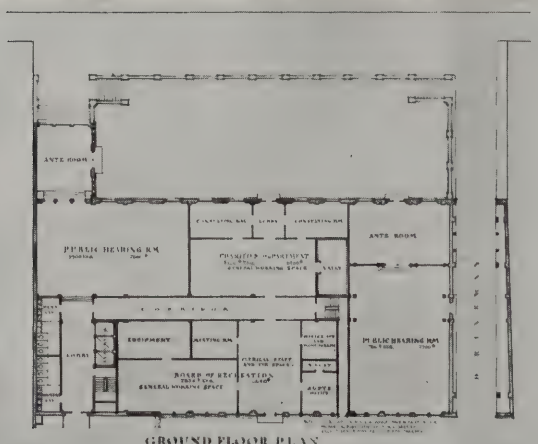
ORANGE STREET ELEVATION



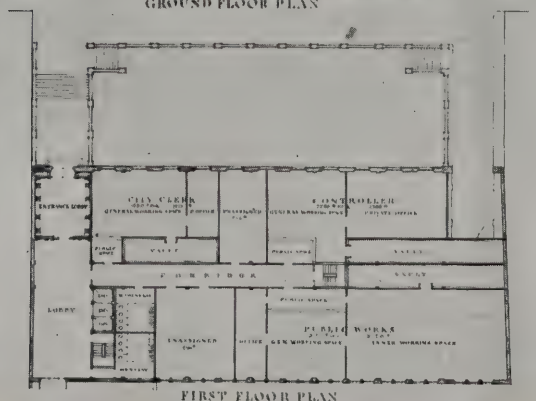
SECTION THROUGH FIRST UNIT

COURT STREET ELEVATION

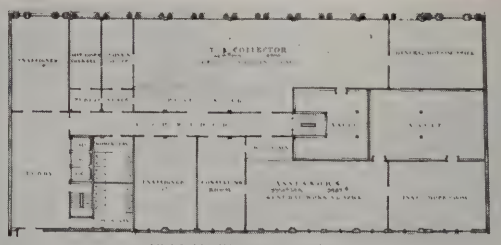
LONGITUDINAL SECTION



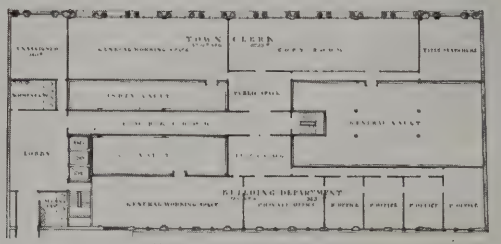
GROUND FLOOR PLAN



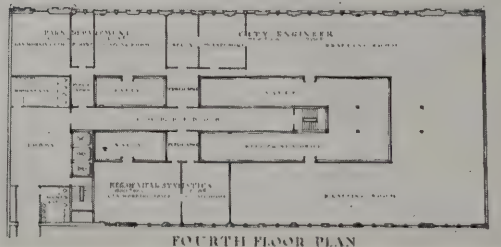
FIRST FLOOR PLAN



SECOND FLOOR PLAN

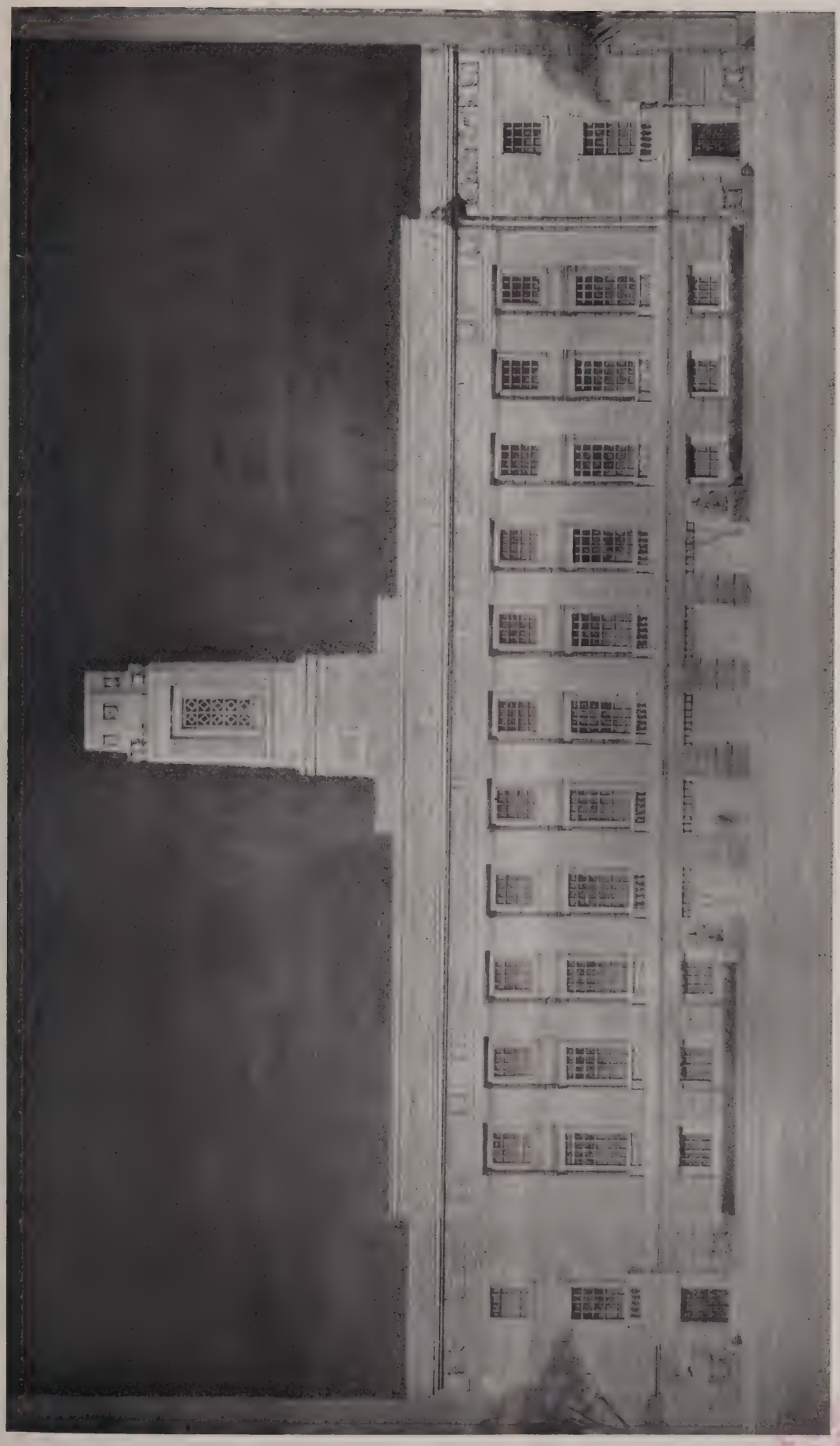


THIRD FLOOR PLAN

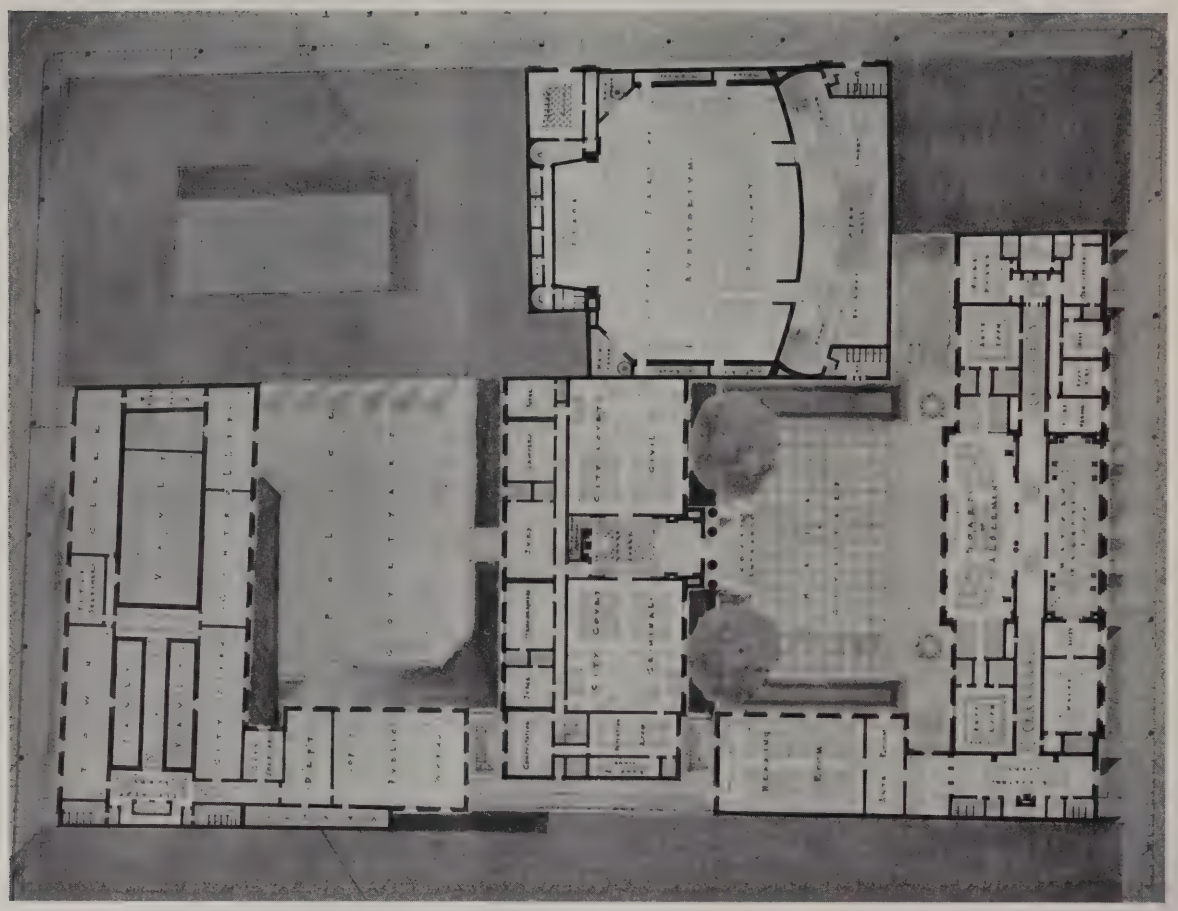


FOURTH FLOOR PLAN

PLANS AND ELEVATIONS OF THE WINNING DESIGN, NEW HAVEN CITY HALL COMPETITION



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
DOUGLAS ORR, ARCHITECT



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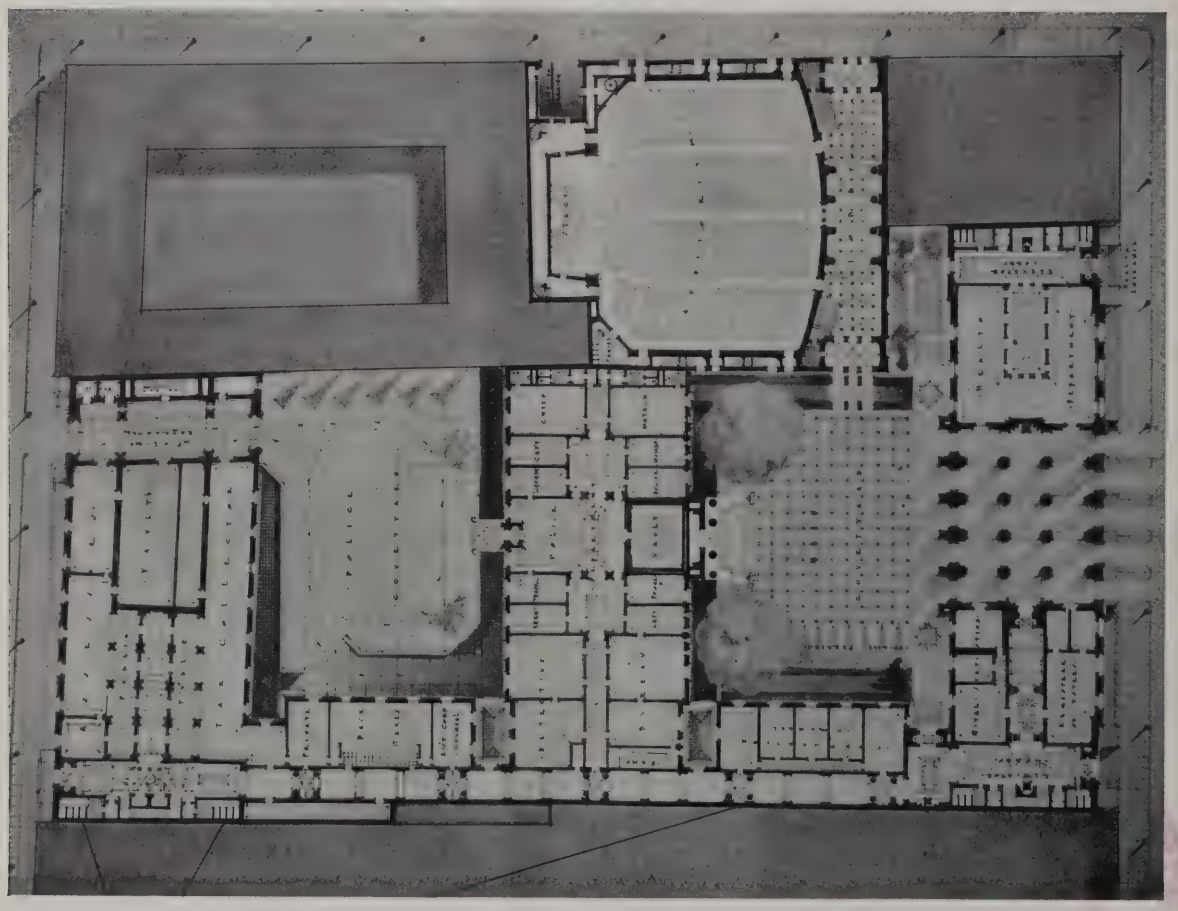
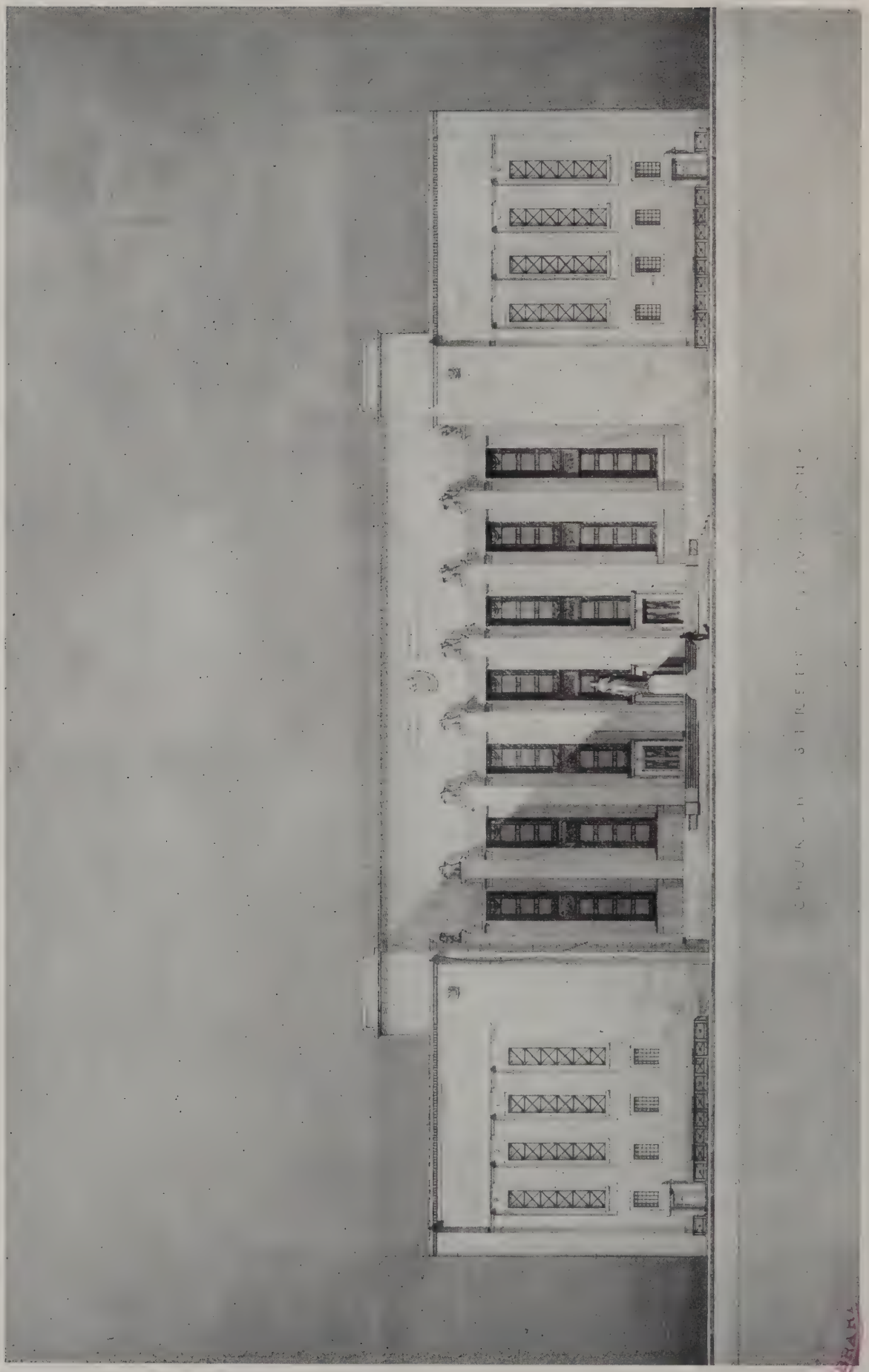


FIRST FLOOR

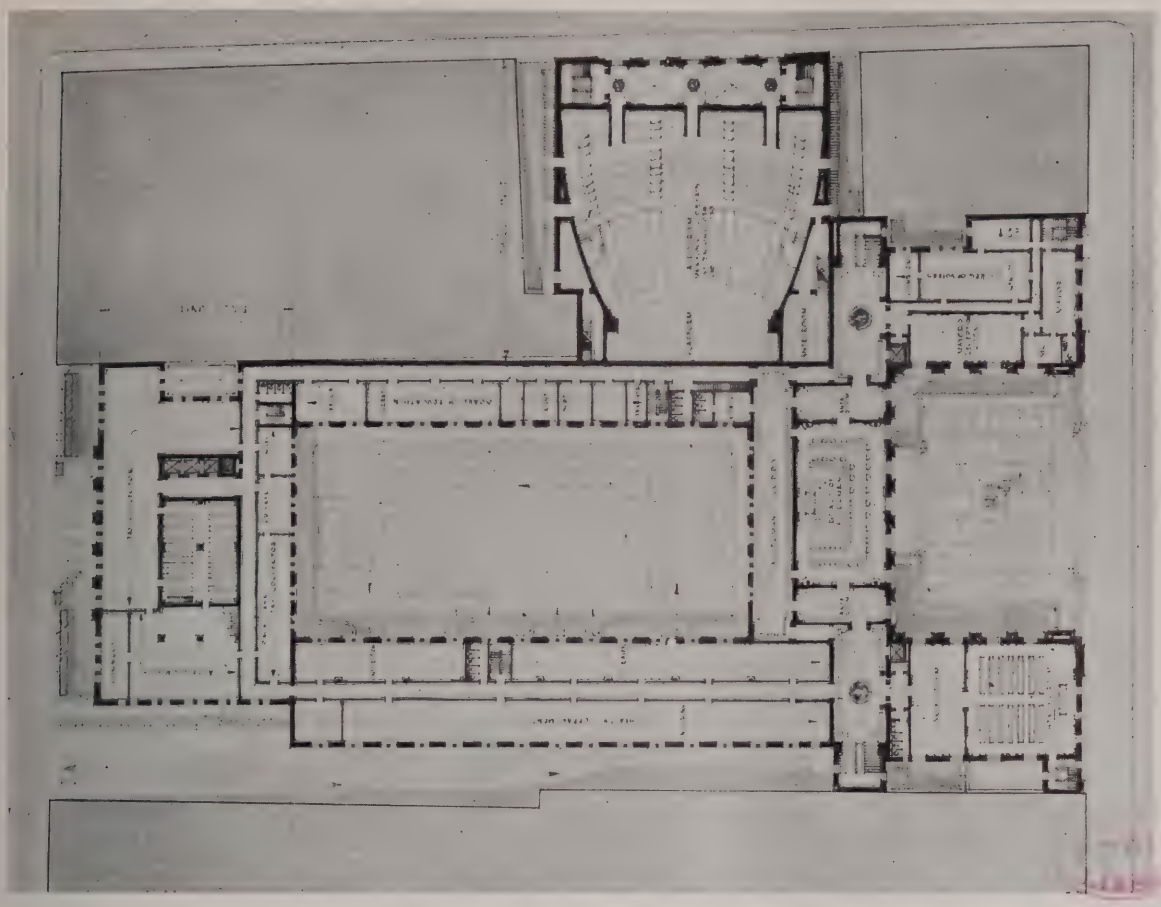
NEW HAVEN CITY HALL COMPETITION
DOUGLAS ORR, ARCHITECT

ORANGE STREET ELEVATION

NEW HAVEN CITY HALL COMPETITION
DOUGLAS ORR, ARCHITECT



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS



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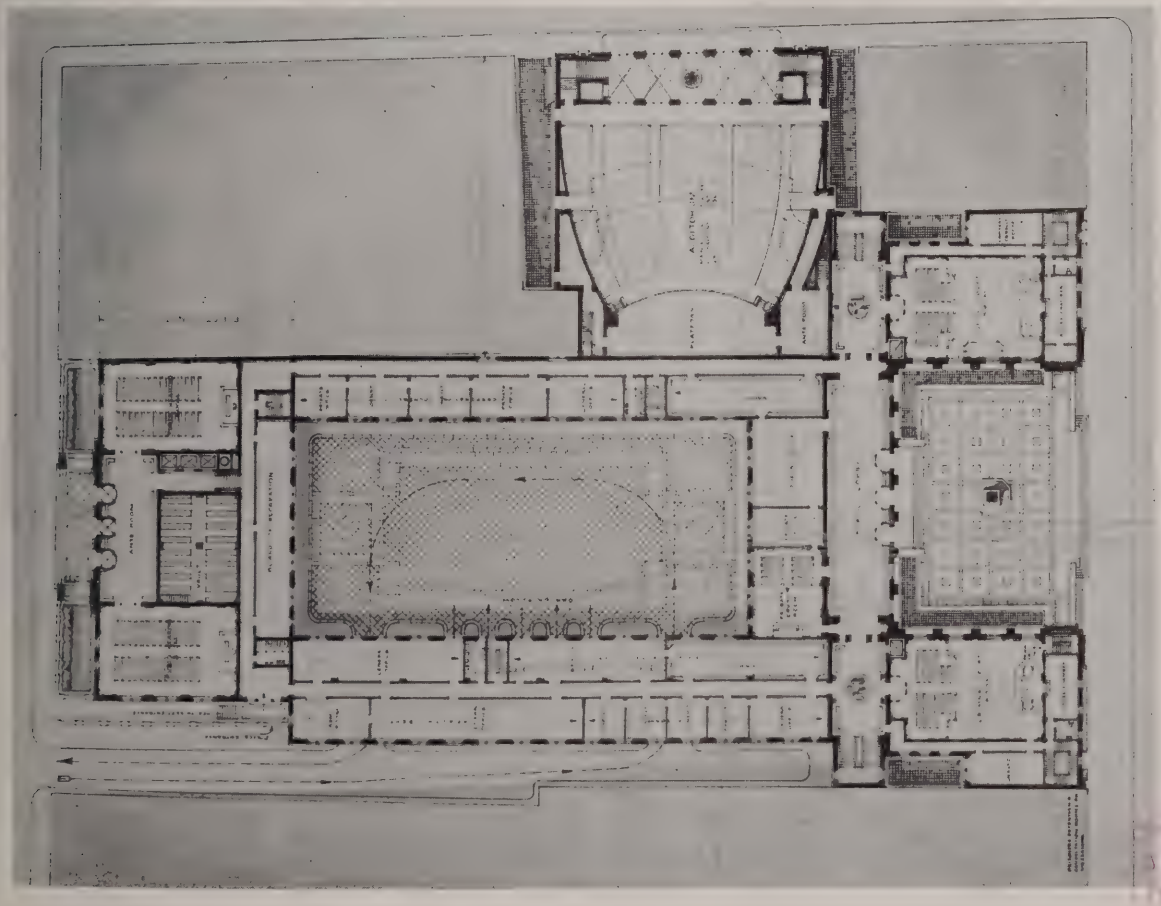


FIRST FLOOR

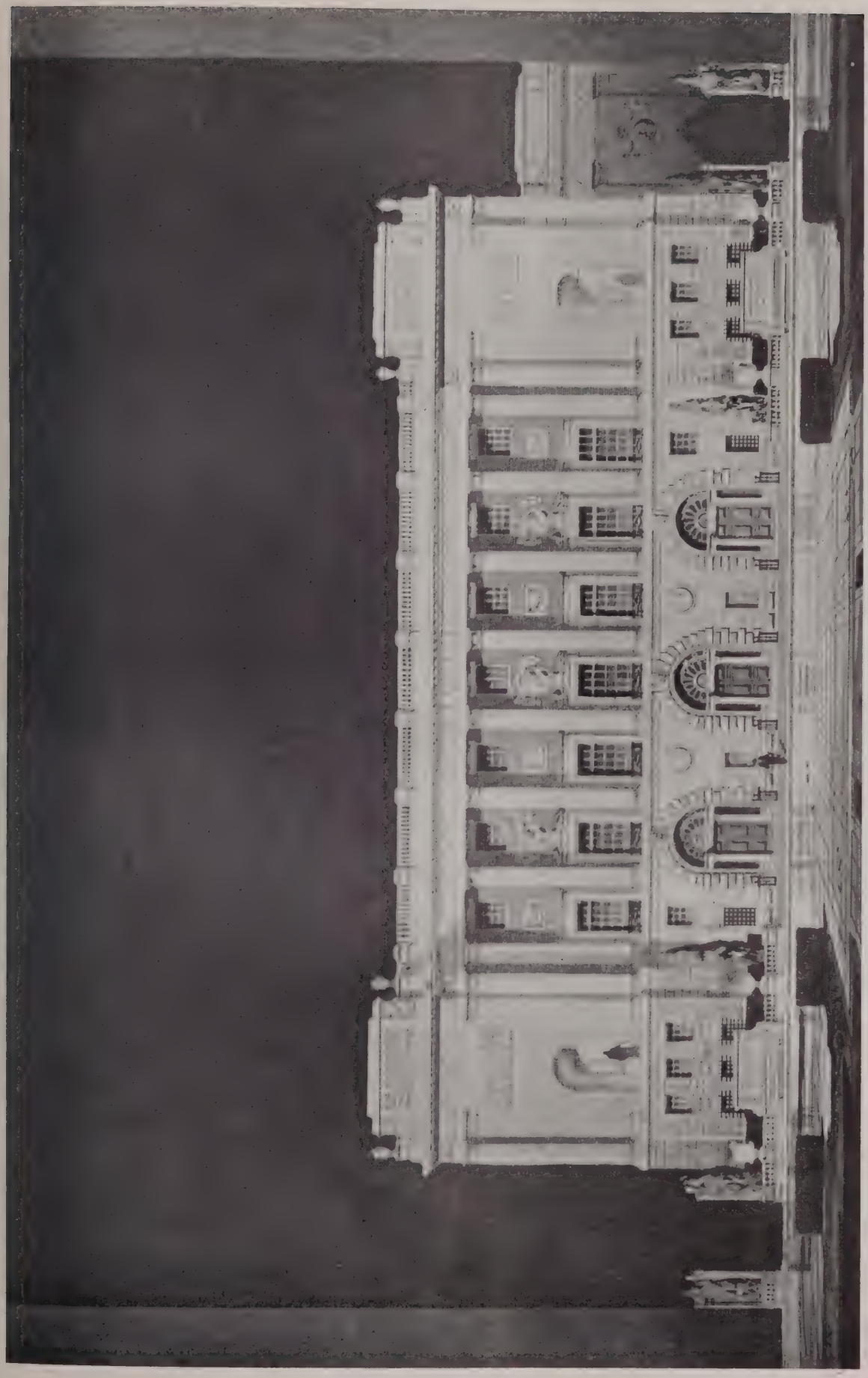
NEW HAVEN CITY HALL COMPETITION

HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS

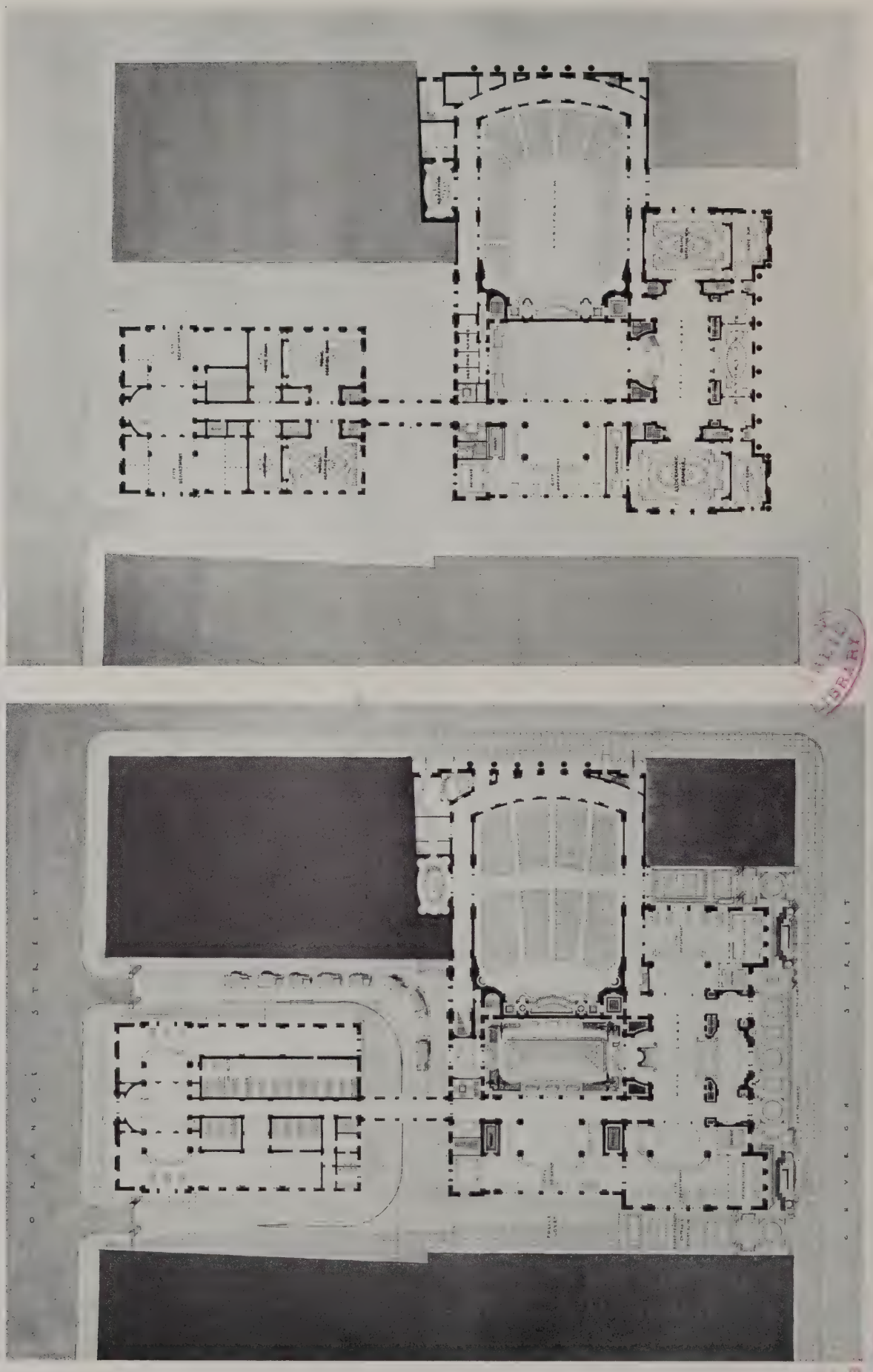
COURT STREET ELEVATION

NEW HAVEN CITY HALL COMPETITION

HARRISON EARL BALDWIN AND PAUL PHILIPPE CRET, ASSOCIATED, ARCHITECTS



CHURCH STREET ELEVATION, NEW HAVEN CITY HALL COMPETITION
WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS



SECOND FLOOR

NEW HAVEN CITY HALL COMPETITION

MAIN FLOOR

WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS

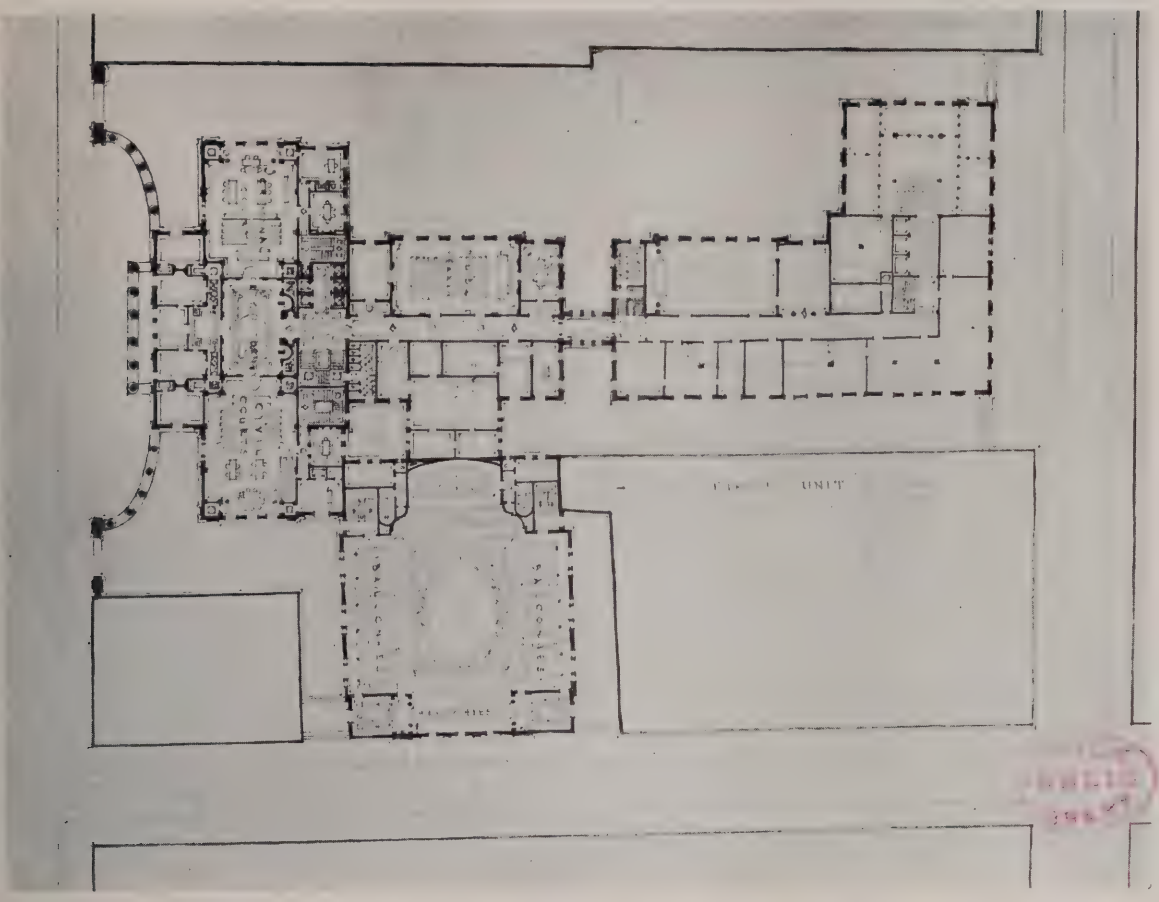
ELEVATION OF AUDITORIUM, ON COURT STREET

ELEVATION OF FIRST UNIT, ON ORANGE STREET

NEW HAVEN CITY HALL COMPETITION

WALTER SHINER AND DENNISON & HIRONS, ASSOCIATED, ARCHITECTS

NEW HAVEN CITY HALL COMPETITION
ZANTZINGER, BORIE & MEDARY, ARCHITECTS



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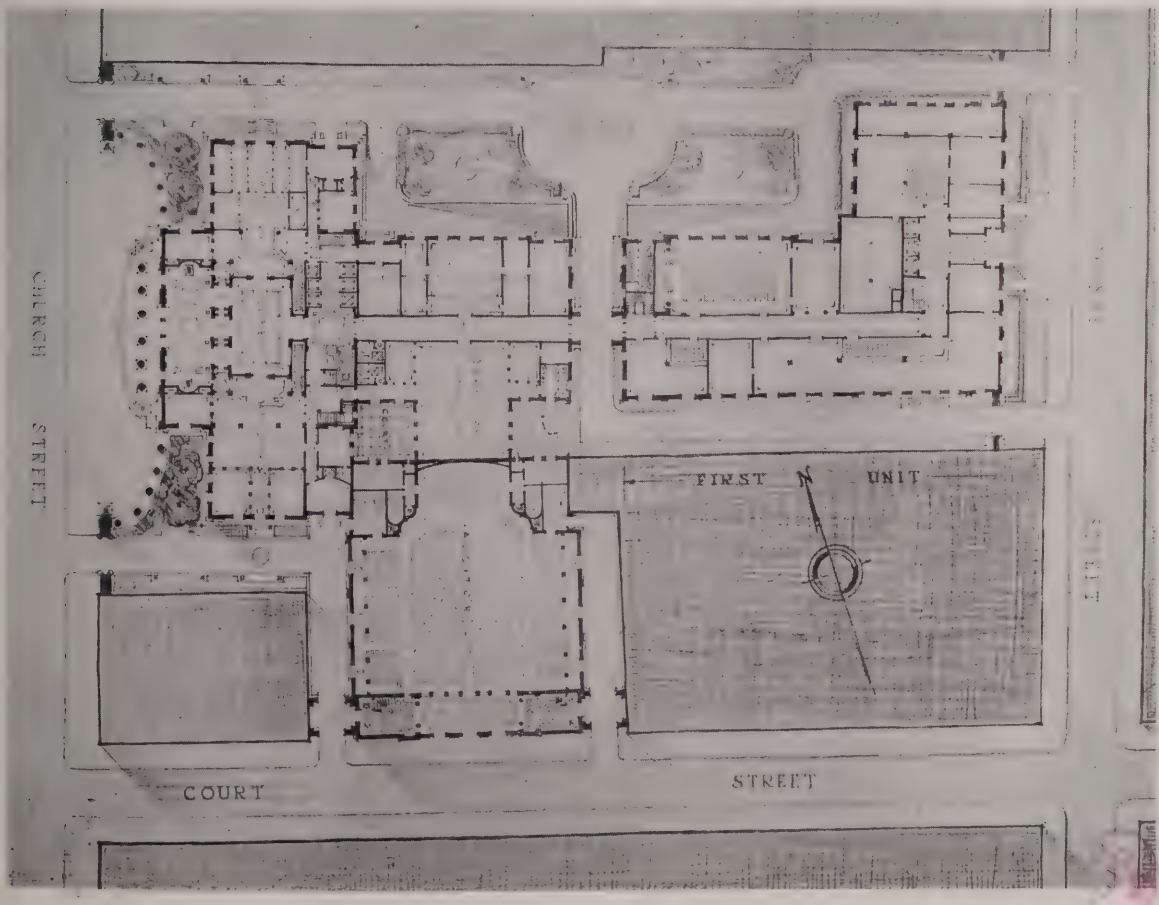
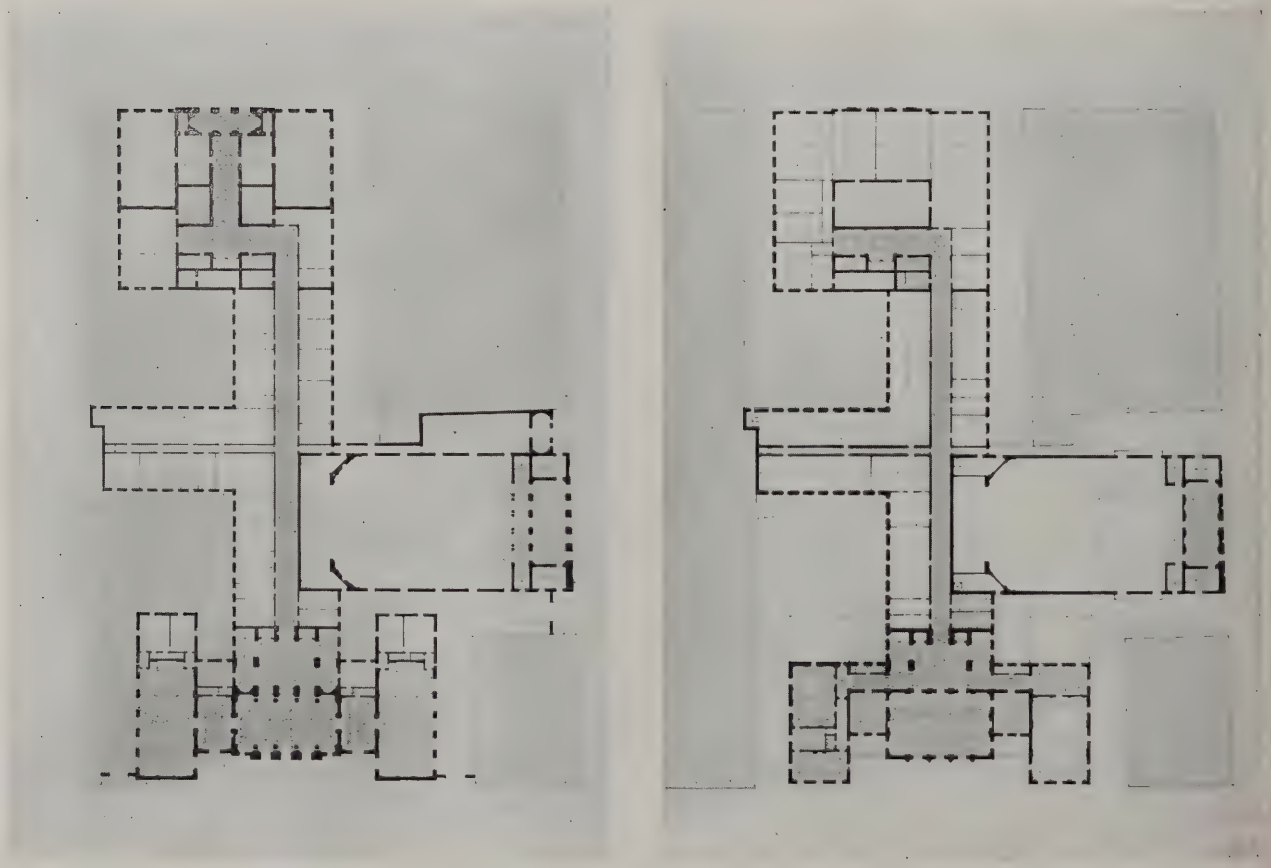


FIRST FLOOR

NEW HAVEN CITY HALL COMPETITION
ZANTZINGER, BORIE & MEDARY, ARCHITECTS

CHURCH STREET ELEVATION



FIRST FLOOR SECOND FLOOR

NEW HAVEN CITY HALL COMPETITION

DELANO & ALDRICH, ARCHITECTS

A REGENCY HOUSE AT FARNHURST-BY-NEW CASTLE, DELAWARE

TEXT BY HAROLD D. EBERLEIN
MEASURED DRAWINGS BY W. POPE BARNEY

THE little Regency house at Farnhurst-by-New Castle, in Delaware, shown in the accompanying half-tone illustrations and plates of measured drawings, is one of those documents of American architectural history that deserve to be cherished and preserved with the utmost care and studied with close attention. It was built between 1815 and 1820, and is as perfect an expression of small domestic architecture in the Regency manner as anything to be found in America. Indeed, it would be difficult to find in England any better small example of this phase of design, which reached its ripest development during the first quarter of the nineteenth century. For subtle elegance of composition, delicacy of detail and reticent simplicity it can compare favorably with any of its like-sized peers, on either side of the Atlantic, cast in the mould of that tradition begun by Henry Holland and carried on by Nash and Papworth, Cockerell and Mylne, in England, and by Latrobe, Robert Mills and Graff, in America.

This small but once perfectly appointed "gentleman's seat," near the banks of the Delaware River, has now fallen into a sorry state of decay, not so far advanced, however, that it could not be arrested and the fabric restored to sound condition without serious difficulty. Much as this decay is to be deplored, it has nevertheless made it possible to examine the structure, so to speak, in certain particulars far more readily and with far more certitude of results than could have been expected had the building been in perfect repair. To illustrate, unless the thin wood ceiling of the little semi-elliptical portico of the west front had been rotten and partly gone, it would have been hard to determine what was the exact original contour of its roof,—whether it was a true half-saucer dome, as it should have been according to the best usage of the period, or whether its now somewhat lumpish contour was merely the result of repeated and clumsy patchings with odd pieces of tin,—which seemed by no means impossible. Taking advantage of the holes in the decayed wood ceiling, however, with the precarious aid of a rickety ladder that threatened to collapse every minute, and by thrusting arms and heads through the holes in the boarding, the exact contour of the original oak forms could be determined. The roof was unquestionably a half-saucer dome, with a slight outward flare at the eaves. Again, the uncared-for condition of the exterior made possible the settling beyond all peradventure of several questions about the belt course and the joinery of the shutters. The method of joinery appears in the plates of measured drawings, so that further comment on that score is unnecessary. In the matter of the belt course, however, it should be noted that the decoration of Greek key frets is made of cast iron. The units are small, and each unit is held in place by three screws at the angles. These screws are fastened into wooden wedges that had first been driven into the mortar joints between the bricks, the stucco being applied afterwards. No trace of color or of paint of any sort now remains on the iron frets. Their surfaces

Photos. Frances B. Johnston and Harold D. Eberlein
South End

West Portico

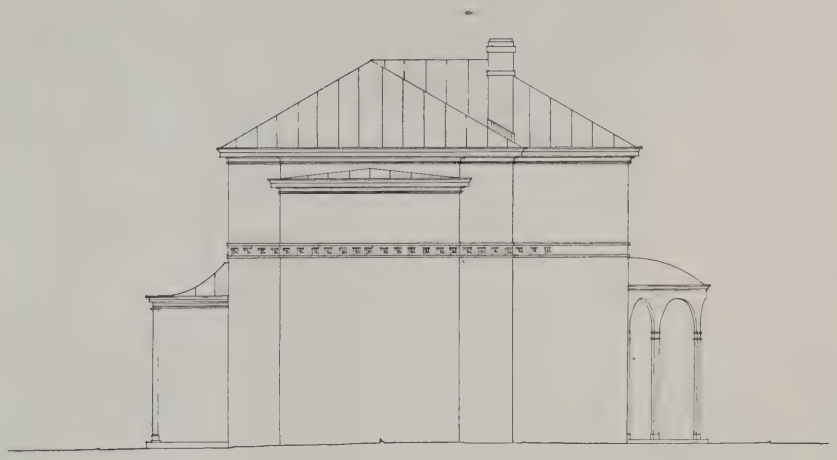
The East or River Front

East Elevation

Regency House at Farnhurst-near-Newcastle

Scale 0 5 10 15 20

The West or Garden Front



North Elevation

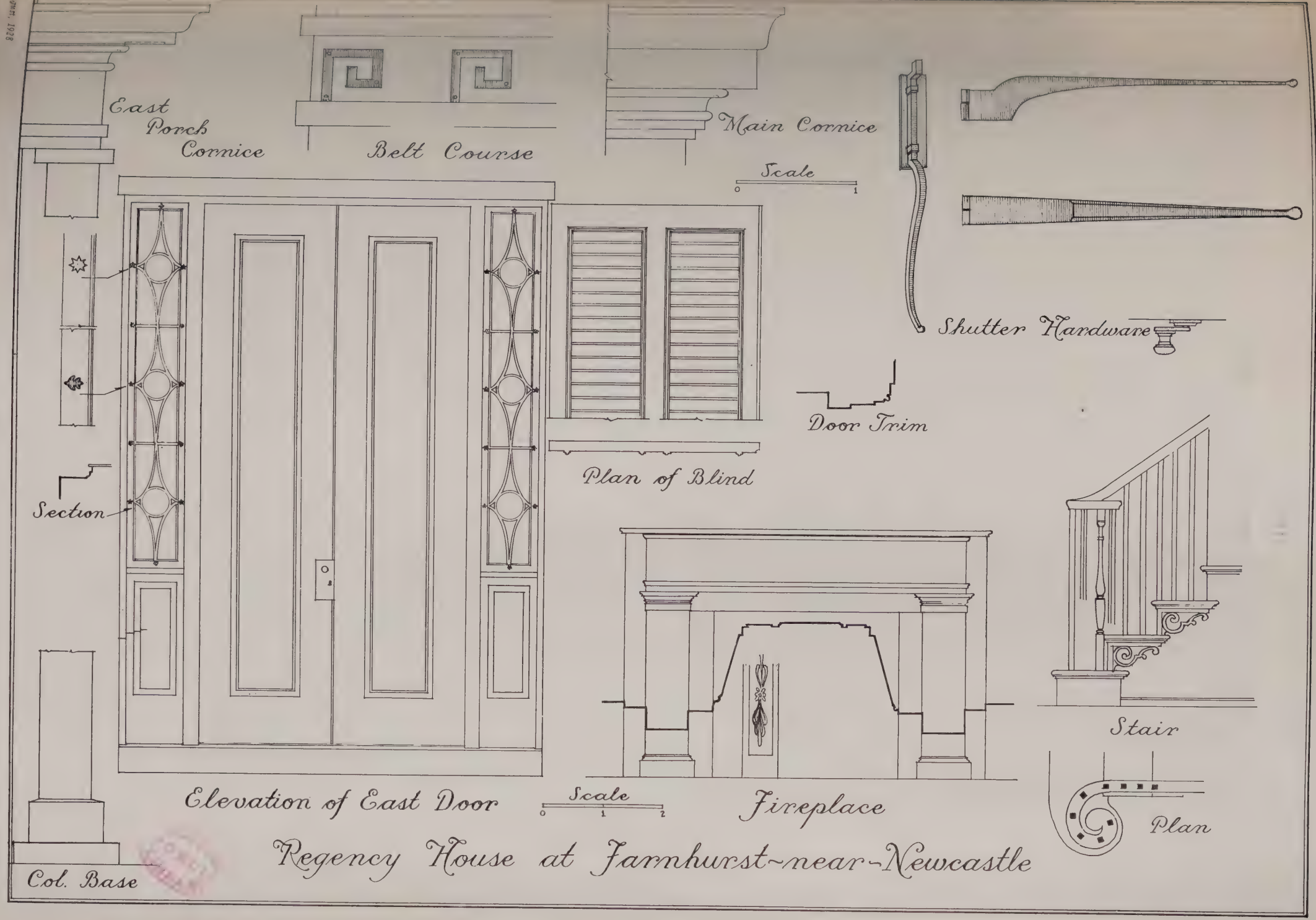
Regency House at Farnhurst-near-Newcastle

Scale 0 5 10 15 20

South Elevation

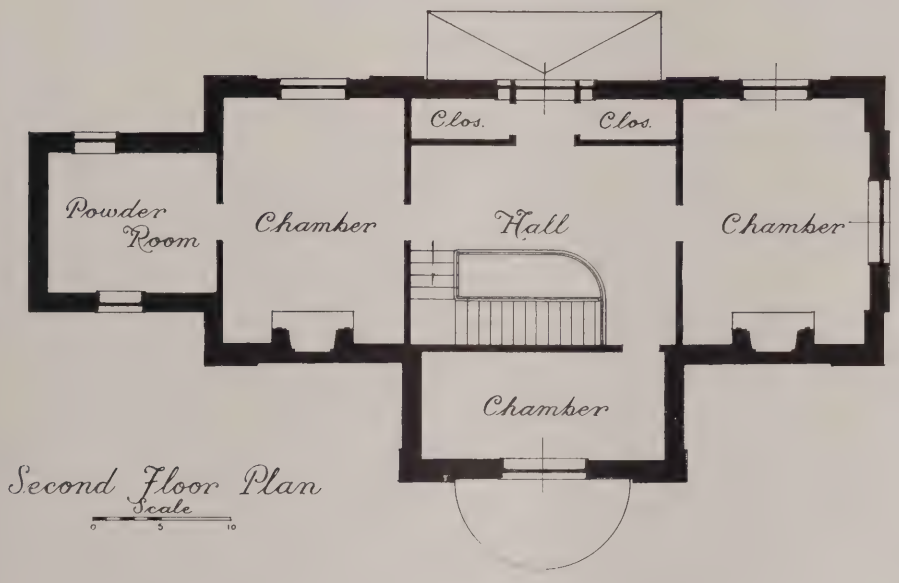
Regency House at Farnhurst-near-Newcastle

Scale 0 5 10 15 20

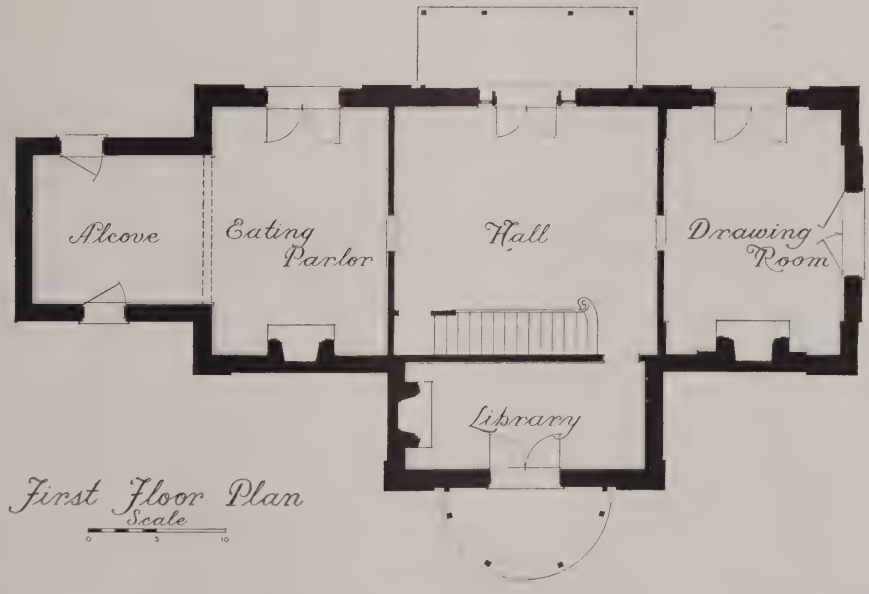


Regency House at Farnhurst-near-Newcastle

STAIRWAY, REGENCY HOUSE AT FARNHURST-BY-NEW CASTLE, DEL.



Pegency House at Farnhurst-near-Newcastle



Pegency House at Farnhurst-near-Newcastle

projected from the face of the stucco and, in all likelihood, they were originally painted black or, less probably, of a color to correspond with the stucco.

The main entrance seems to have been originally on the east front, facing the river, access being through the veranda and the wide door into the hall. What was the layout of the surrounding grounds, it is now impossible to determine. There are still traces visible here and there of what seems to have been a regularly plotted garden with definite form to the south of the house and immediately before the south window of the drawing room, but they are only the merest traces and not sufficient to make possible the reconstructing of a plan. The only feature of which enough vestiges remain to conjecture fairly accurately its lines, is the drive. This appears to have come in from the west and then to have made a circling course around to the river front of the house, whence it continued its curve to the coach house on the north. It also seems likely, so far as one can judge from the remnants of the planting, that there was once a broad vista from the east front of the house toward the river, the straight lines of the trees diverging from the house wedgewise with the head of the wedge at the farther ends of the groves. For the rest, there is only one lone box tree beside the west portico as a reminder of its symmetrically placed fellows, some of which the present occupants say were still living when they came to the place 14 years ago.

One exceedingly interesting and subtle feature of the composition is the way in which the corner pylons of the west and east fronts immediately at the angle become flush parts of the north and south walls, while these walls break forward across the center in the portion containing the windows. It is also worth noting how the height of the belt course increases the scale of the house. The rather exceptional measurements of the glazing are worth observing; the panes in the south casement of the drawing room are 12 inches by 22. These in the east casements are the same in height, but narrower to accord with the narrower window opening. The muntins are uniformly $\frac{5}{8}$ of an inch in thickness. This was the usual width prevalent at the period. The paving of the west portico is of brick, that of the east veranda of squares of white and gray marble laid chequerwise. The portico and veranda columns stand on white marble plinths.

It is a curious fact that the detail of the woodwork inside the house does not correspond in refinement with the exterior detail; this includes the inner detail of the casements, which is of the same character as the exterior work. In fact, the interior detail is much coarser, less studied and rather dull. The explanation seems to be that the outside of the house was finished at the period of erection while, for some cause now unknown, the finishing of the interior was postponed to a later date when the heavier influence of the purely Greek Revival began to make itself very perceptibly felt. It seems impossible to believe that the exterior and interior details could have been designed by the same hand or, at least, designed at the same time. Whether the stuccoed surface of the outside walls was ever painted or not, it is now impossible to say. In any event, the surface was smoothed with care, and the structure always displayed an aspect of extreme suavity. In these days of exaggerated plaster textures, very obviously and laboriously smeared and dented in order to produce meretricious "artistic effects" for exteriors, it is a relief to find the dignified, restful placidity of a wall surface such as that of this little Regency house in Delaware. Its reticence and dignity render it acceptable as a model for present-day country house architecture. It possesses a charm which is enduring.

Old Coach House, Farnhurst-by-New Castle, Del.

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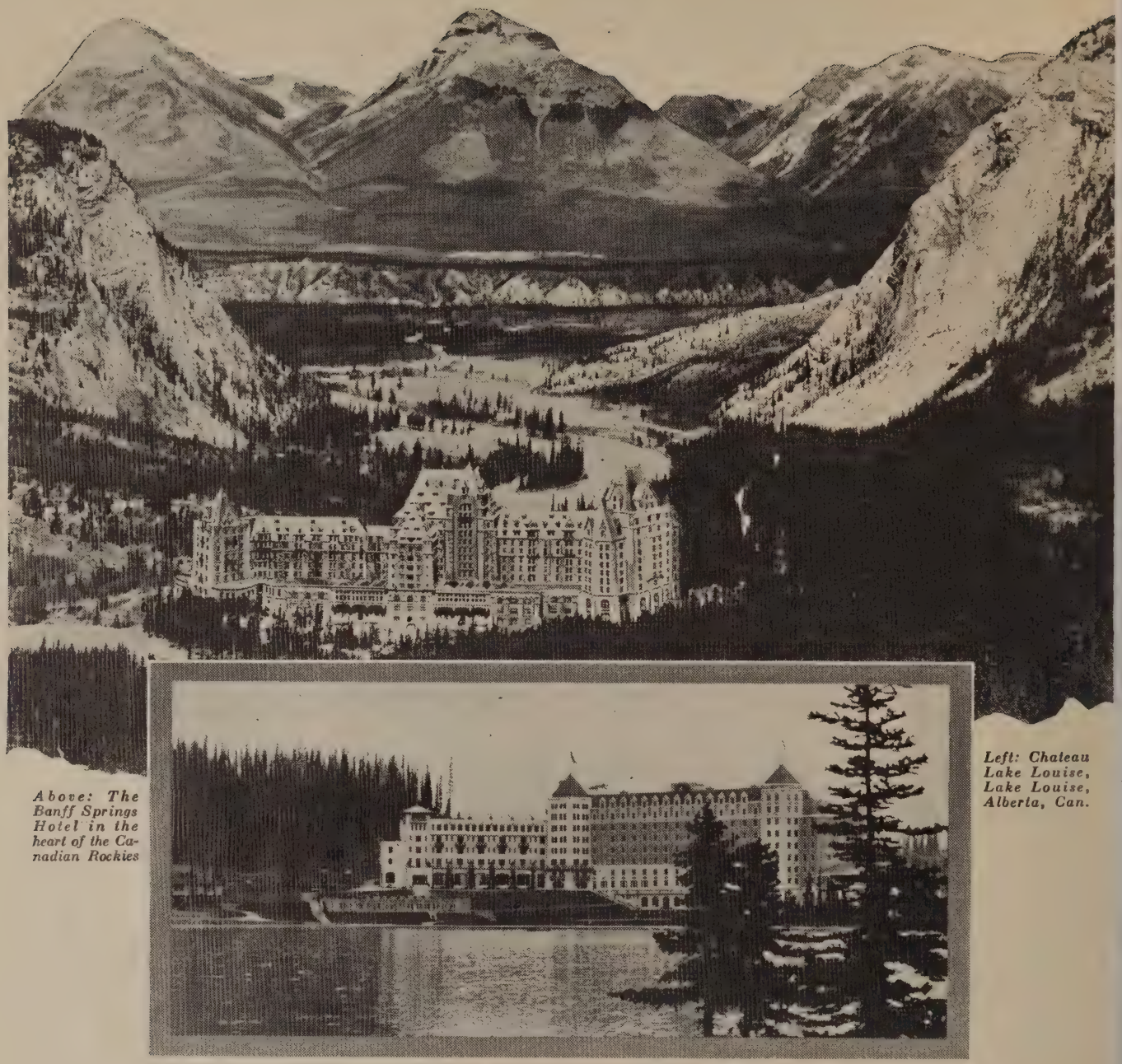
IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

AUGUST

1928



Above: The Banff Springs Hotel in the heart of the Canadian Rockies

Left: Chateau Lake Louise, Lake Louise, Alberta, Can.

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BOOK DEPARTMENT

HOTEL PLANNING AND OUTFITTING

A Review by
TYLER STEWART ROGERS

ONLY rarely does the occasion arise when an individual or an organization, well equipped through broad experience and accurate knowledge, undertakes the production of an authoritative and comprehensive reference book on a subject so complex in its many ramifications and so important to the architectural profession and to the industry it serves as the planning and equipment of hotels. The very difficulties surrounding such an enterprise have been largely responsible for the dearth of sound information, in book form at least, on the problems involved in the development of modern hotels.

The hotel business today forms a vast industry, which for its materials, equipment, supplies and service reaches out into every channel of manufacturing, commercial and professional activity. It is called upon to provide adequate shelter, food, and a thousand forms of service for the traveling public. In addition to serving transient guests, the hotel industry must provide permanent housing and minister to the material wants of thousands of families which have given up the struggle with the servant problem to seek immunity in the shelter of apartment hotels, where service is perforce of a coöperative nature, and where the problems of domestic management are centralized. No form of effort, in fact no single type of business activity, represents so complicated a series of problems as does the modern hotel industry. It is functioning actively in every town and city, in the suburbs and the rural areas, along every highway, at every resort. Wherever people are, there are hotels; whatever their material wants, hotels supply them. This is indeed the most intimate of all industries, closest to the daily life of the country. Where but a few years ago hotels could be numbered by the hundreds, there are now thousands; where there were but two general types, there are now at least five, and all in wide and general use.

"Hotel Planning and Outfitting" is an impressive work of some 438 pages, well printed and bound and illustrated profusely with half-tones and many color plates and with plans of approximately 100 hotels now in active operation. Its publication was possible only because it is the product of the largest of the organizations catering to the hotel industry, an organization that has developed through a half-century until it is the only one of its kind that can completely furnish and equip a hotel from the bare walls to the point where the house is ready to open its doors to the public. The compilation of this book

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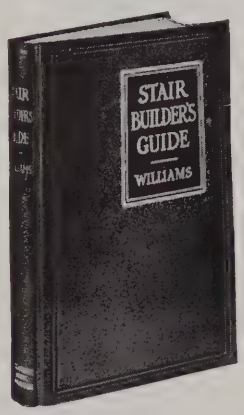

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represents over two years' careful research and analysis by officials of the Albert Pick-Barth Companies together with the research of several consulting specialists who were retained for the purpose. The material has been drawn from a large group of hotels whose outfitting was executed wholly or in part by the Pick-Barth organization, and it represents a dependable cross section of the industry. The editors include C. Stanley Taylor, member of the firm of Lyon & Taylor, architects, New York, consulting editor of THE ARCHITECTURAL FORUM and *Hotel Management*, and general consultant on the design and economics of hotel projects; and Vincent R. Bliss, of the Albert Pick-Barth Companies; the contributors and consultants include Alexander B. Trowbridge and Harry Prince, consulting architects, and Horwath & Horwath, hotel accountants, and many others.

For the purpose of discussion in this book, hotels have been divided into three general types, wherein the problems of design and service vary to a marked degree. These are commercial, residential, and recreational, each serving a radically different purpose, but all operating along the same economically fundamental lines. Commercial hotels must be considered under two divisions,—first, the great urban hotels, of which there are relatively but a few, and second, the average 100- to 300-room commercial hotels located in the smaller cities and towns. It may be noted here that this book gives primary consideration to hotels of average size rather than to the complicated individual problems of the great hotels of our larger cities. The soundness of this plan is obvious. Information based on average experience is of great value to those conducting or about to engage in the operation of hotels of average size. The owners of very large projects can well afford to engage the services of hotel consultants; furthermore, the problem of the large hotel is highly individual in character, and here average experience is difficult to determine and uncertain of application. For the hotel of average size, however, data based on contemporary experience are invaluable. Attention is also given in full detail to the problems of the residential or apartment hotel, of which four types are recognized, based on the size and occupancy of the apartments and the type of food service rendered; and to the problems of resort hotels, where a wholly different purpose introduces many considerations not encountered in other hotel work.

The thoroughness with which the subject of hotel planning and equipment has been treated is best shown by a brief review of the contents. The first ten chapters are devoted to the planning of hotels, each type first being discussed with great clarity from the economic viewpoint, then taking up planning and construction problems, and finally architectural considerations. Chapters I to III are concerned with Analyzing the Commercial Hotel Project, Planning and Building, and Exterior Architecture. These chapters are followed by a group of fine duotone plates illustrating a large number of successful commercial hotels with their typical floor plans. Chapters IV to VII inclusive are similarly devoted to the Apartment Hotel and are followed by a series of plates with plans. Chapter VII discusses the Bachelor Hotel, and Chapters VIII to X inclusive are concerned with Resort Hotels. Before leaving planning problems, one chapter takes up the Remodeling of Hotels for Increased Profits.

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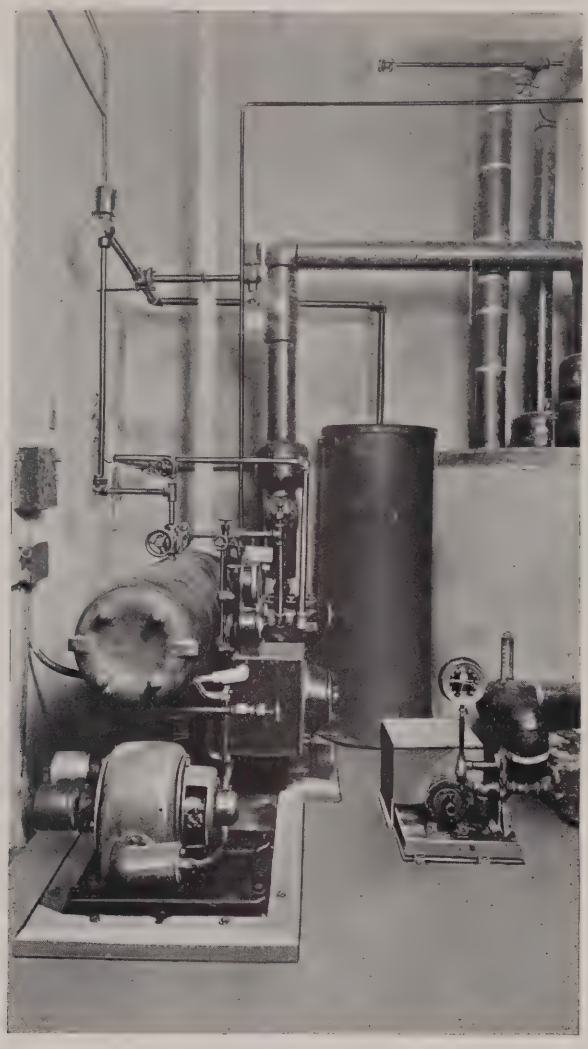

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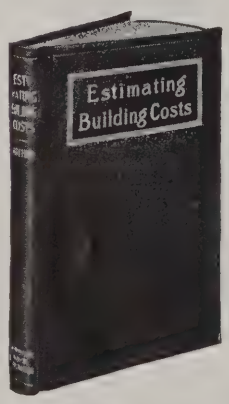

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Beginning with Chapter XII on Planning the Hotel's Furnishings, which is followed by a series of color and duotone plates, five chapters are devoted to furniture, carpets, draperies, linens and bedding. This section is followed by Chapter XVII, on the application of space-saving conveniences, in which the uses of doorbeds, built-in furniture, kitchenette equipment and other space economizers are fully developed. The remaining six chapters are devoted to the very important matters of food service facilities, including their relation to hotel planning, the general principles involved in food service layouts. facts about the construction of food service equipment, and invaluable data on silverware, glassware and china for hotel use. Throughout the book there will be found reference charts, tables, and summaries which present in convenient and highly useful form a great mass of practical information on various aspects of hotel planning and equipment. A large part of this material is not available elsewhere; much of the economic and cost data has never before been discussed in any publication. The rich experience of the executives and of the planning, engineering, technical, and merchandising staffs of the Pick-Barth organization is drawn on freely in the text, and these reference tables, provide for the first time to architects and to hotel executives a summation of practical knowledge gained through the closest sort of contact with thousands of hotels and with every type of hotel problem. The analysis of hundreds of hotel plans and of economic problems by Mr. Taylor and the consulting architects engaged with him in this work, and the presentation of much cost information by Horwath & Horwath, whose work is well known to hotel men, and equally authoritative information, rounds out the subject matter into a full and complete treatise on the hotel.

This volume is in no sense a manufacturer's catalog, though sponsored by and produced for a commercial organization. The tremendous production expense is made possible by the fact that the illustrative material shows work accomplished by this organization, which, because of the extraordinary breadth of its service in no wise limits the scope of the book, and by the nominal charge at which the book is sold. The architectural profession would profit largely if commercial organizations in other fields would publish equally authoritative and unbiased data on various similarly complex architectural and construction problems, which confront architects.

HOTEL PLANNING AND OUTFITTING; Commercial, Residential, Recreational. 438 pp., 8½ x 11½ ins. Price $10. The Albert Pick-Barth Companies, Chicago and New York.

THE GEOGRAPHY OF AMERICAN ANTIQUES. By Lurelle Van Arsdale Guild. 283 pp., 7¾ x 9¾ ins. Price $4 Net. Doubleday, Page & Company, New York.

THIS book is a guide to American antiques, to the furniture and household crafts produced from the time of our early colonists, of the period of the Pilgrim Fathers, to that of the Empire in the early portion of the nineteenth century,—to be exact, from 1820 to 1830. Ordinarily, all of this is considered together under the one term "Early American," and the student of that period is often confused by the medley of racial influences which he notes in the pieces thus designated. He will be happy to find in this work a complete and well ordered survey to dispel his confusion. The history

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of any period style involves necessarily the history of the people behind it, and prior to 1790 nine nations played noteworthy parts in the settling of our Atlantic seaboard. Each colony was confronted with different necessities, and drew from different inspirations at home; hence, each evolved a quite different style of household crafts and furnishings. Dividing the territory, state by state, the author shows how foreign styles and influences were modified by American conditions, and how household arts were related to the social conditions of the times. He traces the rise in each colony of master craftsmen, of greater and lesser cabinet makers, silversmiths, clock makers and glass blowers, relating interesting facts about the lives of each and the source from whence he drew his inspiration. By making his division geographical, he shows for what crafts each colony became famous.

Mr. Guild is not only an authority on antiques, but an interior decorator and artist as well. One of the distinctive features of his work is its profusion of illustrations. He has illustrated the pieces he describes by means of some 700 of his own drawings, with a pictorial glossary to which the reader may refer. In this way the volume is a store house of accurate information.

NORTHERN ITALIAN DETAILS. By Walter G. Thomas and John T. Fallon. 143 Plates, illustrated and measured drawings, 9 x 12 ins., with introduction by John Mead Howells. Price $10. Scientific Book Corporation, New York.

NOT a little of the success with which architects and landscape architects, interior decorators, woodworkers, and makers of furniture are using Italian motifs is due to the extent to which measured drawings have been supplied to them. Architectural draftsmen and writers have traveled into every corner of Italy and have selected what seemed likely to be most useful, photographing and securing measured drawings with a fidelity to the original which is proved by the success with which their illustrations and drawings are followed in America. One of the most useful and best known of these works is that for which the material was gathered in northern Italy some years ago by Messrs. Thomas and Fallon, the material being published in one of the architectural journals and later issued in book or rather portfolio form.

This widely known work includes half-tone illustrations and measured drawings of details of buildings of many kinds and of the objects which they contain,—structural details, such as stairways, balconies, balustrades and parapets; doors and windows, cornices, loggias and colonnades; details used in gardens, such as fountains, urns, vases and pedestals; and objects such as tables, benches and chairs, which of course classify as furniture. The details illustrated are not so much those of large scale and great cost as those of a character likely to interest architects engaged in work of moderate size or extent. The great usefulness of the original edition of this volume is ample warrant for the issuing of this later edition. The great favor with which architects received the original issue and the wide extent to which these excellent details have been used during several years bespeak a welcome for a new edition. As has already been said, the authors or compilers exercised rare taste and discrimination in the choice of their material. This new edition, like the original issue, contains an introduction by John Mead Howells, adding to its interest.

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The Architectural Forum

THE
ARCHITECTURAL
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VOLUME XLIX NUMBER TWO

AUGUST 1928

ARCHITECT AND CONTRACTOR, CO-WORKERS

BY
A. KENNETH McKEAND*

SO swift has been the pace in the development of modern building construction that there has been little opportunity to pause and ask ourselves where we are headed for, what landmarks have been passed, and whether we are moving forward in an organized body or in splendid, but unrelated, units. Progress, unbelievable progress, has been made, obstacles overcome, victories won, in which the owner, architect, engineer, contractor and manufacturer alike have each played an important part, and it is only human that each should ascribe to himself the major part in the achievement, and only partially realize that without the others, his efforts would have been unavailing. Nevertheless, the realization of this mutual dependence must be grasped if the fullest use is to be made of the opportunities that lie ahead, and it is the purpose of this article to show in what way the contractor is qualified to take his place in the councils of the leaders in this development, and to set forth the services he is prepared to render.

In the same relation that the "charge of the six hundred at Balaklava" stands to modern warfare, stands the "builder" of 50 years ago to the modern engineer-contractor of today. His function has changed from that of a master-mechanic, who by dint of leadership and ability could bring together the few simple factors entering into the smaller building operations of the period, to that of an expert controlling a diversity of elements over a wide field, and coördinating them into one comprehensive plan of action. The builder has not been alone in adapting his services to rapidly changing conditions. The modern architectural office bears as much resemblance to that of 50 years ago as a building of the '70's to the last word in steel construction today. Paradoxically, it is the very complication of mechanical and engineering problems that has given back to the architect-designer his true place in the structural scheme, and just as he has met the challenge of the zoning laws by creating new æsthetic formulæ, so did the limitations imposed on him by structural necessity prove the stepping stones to achievement that is the wonder of the world. To him we owe the evolution of the "skyscraper" from something of harsh utility to a form of challenging beauty. But the days have passed when he can claim for himself the sole honor in the creation of a building. As the factors entering into even the simplest of structures have increased in number and multiplied, he has surrounded himself with specialists in many fields, and his principal function is now to correlate the requirements of these experts into one coherent design.

A similar change has meanwhile taken place in the builder's organization. Contrary to popular conception, he is no longer a mere vendor of building. If his functions were simply to erect steel, brick, or concrete, he could be dispensed with and his place taken by a competent foreman. In other words, the essence of modern general contracting lies not so much in the furnishing of labor, materials and equipment, and the brokerage of subcontracts, as in skillful, centralized management for coördinating the work of many different trades, timing, organizing and synchronizing the installation in accordance with some predetermined plan. The experience, knowledge and data that he has gained in the exercise of these functions are what he offers to owner, architect and engineer,—not only in the execution of the plans, but in every stage of the development of the structure, from the preliminary sketch plans of the architect to turning over the completed building.

And yet what too often happens? How frequently have we all seen completed drawings, so cluttered with changes, corrections, contradictions and addenda that it might be presumed that their function was to mislead rather than to guide anyone in their execution. What usually do these last-minute changes represent, if not a belated realization that the owner's and architect's rather vague assumptions as to costs have been unduly optimistic? And so commences the business of cutting, slashing and slicing that will bring the emasculated project within the size of the financial budget. The cities of this country are full of monuments to this wasteful method,—their owners contemplating an ever-growing array of red figures on their ledgers, and their managers floor upon floor of empty offices. The data that would easily

*The author acknowledges indebtedness to Col. W. A. Starrett for aid in the preparation of this article.

Building for Industrial Trust Co., Providence
Walker & Gillette, Architects; George Frederic Hall, Associated
Built for Fixed Fee; Guaranteed Cost Limit
Starrett Bros. Inc., Builders

Building for National City Company, New York
McKim, Mead & White, Architects
Built on Cost Plus Percentage Basis
George A. Fuller Co., Builders

have allowed them to "cut according to their cloth" were in the hands of the builder, but he was not invited into conference. He was being held off until such time as the elimination race should be held which would produce a builder who could in some way construct identically the same building for less money than his competitors!

It would not be hard to imagine the disastrous consequences if a similar competitive method were used in the selection of an architect,—whereby men of varying ability, integrity and responsibility would be called upon to produce plans for a building, to meet certain stipulated requirements,—the award being made solely on the basis of the price at which the design could be produced. And yet the analogy is not so far fetched, for it was precisely out of the system of competitive bidding that there arose the idea that the general contractor was necessarily dishonest, usually unscrupulous, and only to be trusted when closely confined in a straitjacket of rigid plans and specifications and subjected continually to the most vigilant inspection. That such should be the outcome was inevitable, when price, rather than experience or ability, was the deciding factor, and where a builder's instinct for gambling,—on loopholes in specifications, on lax supervision, on probable changes and extras, or a turn in the market,—was of more value than an accurate analysis of building costs. If fortune favored the successful bidder, he pocketed the savings; if not, he was faced with the alternatives of losing money or "skinning" the work, and the interests of owner and builder became as far apart as the poles. The wonder of it is that things have worked out as well as they have under such contending forces, and it is to the credit of both that so many of these alliances have not ended in disaster. But gradually there is awakening a realization of the fact that coöperation and identity of interest between all parties engaged in a building enterprise are of infinitely more value than all the inspection and coersion in the world; and thus the true function of the builder is being established,—as a co-adviser with the architect in the development of a structure, as a cost expert, and as one whose knowledge and experience of practical construction, gained through personal experience in the field, will be applied to produce the best results with the greatest economy of expenditure.

However, the old idea is slow in dying, and its lingering is one of the greatest causes of waste in the building industry. A single example will suffice. One of the largest manufacturers in the allied automotive industries decided on the erection of a new plant to cope with the rapidly expanding demand for his product. Plans were drawn, and bids were invited from about ten of the leading builders. No action was taken on receipt of the bids, but several months later a new scheme was developed and submitted for competition. In all, five distinct and separate schemes were estimated on by all bidders before the contract was awarded. When it is realized that aside from the builder's own organization, estimates

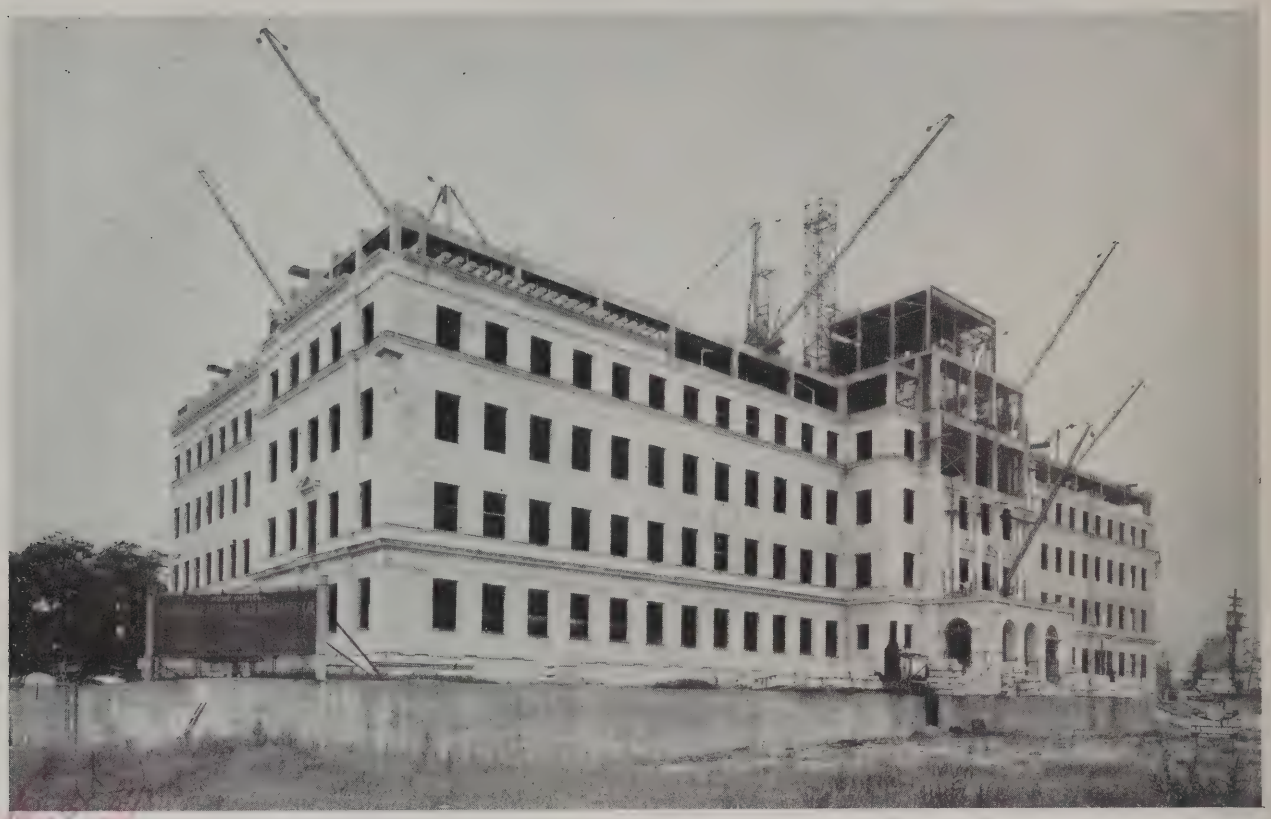
New Jersey Bell Telephone Building, Newark
Voorhees, Gmelin & Walker, Architects
Built on Cost Plus Fixed Fee Basis
Turner Construction Co., Builders

Building of Equitable Trust Co., New York
Trowbridge & Livingston, Architects
Fixed Fee, Guaranteed Limit of Cost Basis
Thompson-Starrett Co., Builders

from 30 or 40 subcontractors were necessary to complete each one of these bids, some idea of the prodigal waste entailed by such a method can be gained,—waste, incidentally, which must be paid for indirectly by the owner in increased building costs, due to the heavy burden of overhead borne by builder and subcontractors alike. What was the alternative? Each one of the builders invited to bid was the potential successful bidder, to whom would be entrusted the faithful execution of the plans. As such, the ability and integrity of one and all should have been beyond question. It is probable that from among the ten builders, some one would have been particularly desirable, through experience in similar work or because of intimate knowledge of local conditions. The owners had much to gain and little to lose by taking such a man into their confidence, making him an interested participant in the enterprise, and compensating him for the experience and pertinent knowledge he would bring to the development of the project,—presuming of course that the owners knew what they wanted and intended to build in good faith. If there were any question in their minds as to what their requirements were, or if economic considerations made the consummation of the project uncertain, there was all the more reason for eliminating useless competition. Not to have done so would, in any industry outside of construction, have savored of sharp practice.

Right here there is one of the weakest links in the building chain. To every one *bona fide* project on which bids are invited, there are several the probability of the execution of which is, to say the least, remote; but however slim the chances are, the owner usually feels perfectly free to put into motion the whole machinery of competitive bidding, whereby he will command the services of several highly trained organizations, without assuming any obligations or compensating them in any way for the time devoted to his project. Much has been said and many suggestions made of ways to cope with this obvious injustice, but the whole underlying cause is the prevailing notion that the only safe and economical way of securing the services of a builder is by competition. Often if the owner knew the reasons actuating the lowest bidder, he would realize, once and for all, the fallacy of such a method and gain some idea of the true functions of the legitimate builder. For, in the last analysis, the cost of a building is the sum total of a certain number of elements,—each comprising labor and material,—and true economy can only come from competent management and organization of the first and from careful, intelligent buying of the second. Given these, a building will cost what it will cost and cannot be made to cost less by any juggling of figures, and this is the price the owner should be prepared to pay. By so doing he will obtain the best and most economical results; there is no way of getting something for nothing.

This method of procedure brings us at once into



Building of Provident Mutual Life Insurance Co., Philadelphia
Cram & Ferguson, Architects
Built on Cost Plus Fixed Fee Basis
Turner Construction Co., Builders

the field of the "cost-plus" contract. Much has been written on this subject, but still the idea prevails,—among public officials, on building committees, and even among certain architects,—that under a cost-plus contract competition is almost or entirely absent, and that the builder has *carte blanche* to pile up expenditure, with little control by the individuals whose money is involved. If this were true, Barnum was indeed justified, because literally billions of dollars have been expended on building construction under the cost-plus form of contract. Fortunately, it is not the credulity of these owners which is in question, but that of the gentlemen who believe that such a method of procedure could have survived one single trial. There are several variations in the form of the cost-plus contract, but the main procedure under all remains the same. The original method compensated the builder in the form of a percentage of the actual cost; but as this was seen as a possible inducement to the builder to run up the cost, it has largely been superseded by a fixed fee, based on the probable cost, as estimated at the outset of the project. Here we have the true professional basis and the foundation of all great economies of construction. Of late years there has been added, as a further protection to the owner, a "guaranteed limit" clause, whereby the builder guarantees that the cost of erecting the building in accordance with the contract plans and specifications will not exceed the amount of his estimate, and assumes responsibility for payment of any excess over that amount. Once again it will be seen that the gambling element has been introduced, but it is gambling with full control of the circumstances and with all the cards on the table. As additional compensation to the builder for such risk as he is running in guaranteeing the cost, and to identify his interests even more closely with those of the owner, he is sometimes allowed a percentage of the saving realized below the upset price. Incidentally, it may be said that the builder who under any of the conditions outlined here fails to regard the interests of the owner as his own, has no place on any building enterprise under any contract.

Several questions may here suggest themselves to the reader. How is the guaranteed cost arrived at? What items of the builder's supervision are directly chargeable to the work, and what are included in his fee? How much of the work is done directly by the builder's own organization? How is competition secured among subcontractors, and what control is exercised by the owner and architect in the letting of subcontracts? How are changes and extras handled? How and when are payments due? There are others, but these are the main items on which the prudent owner will desire to be informed.

First. Upon completion of the final plans and specifications, an itemized estimate will be prepared, giving particulars of all estimates from subcontractors and that portion of the work to be executed directly by the builder, in full detail. To the total of these figures will be added a sum, not usually in excess of 3 per cent for contingencies, and the lump

Photo, Tebbs & Knell, Inc.

Hearst Publication Building, New York
Charles E. Birge, Architect
Built on Cost Plus Percentage Basis
Turner Construction Co., Builders

fee previously agreed upon. The sum total of all these items will represent the guaranteed limit of cost.

Second. As a general rule, no part of the general overhead, nor the service of any officer of the contractor, is chargeable as cost, and only the salaries of such men as are actively engaged on the building site or on actual expediting in the field, are paid by the owner. A careful examination by the writer of the records of some 20 projects revealed the fact that the costs under this head may vary from less than 1 per cent of the total expenditure on a fair sized office or loft building, to as much as 3½ or 4 per cent on a smaller but more intricate structure, where the work must necessarily proceed more slowly, and where the supervisory requirements would be as great as for a building involving two or three times the expenditure. These minimum requirements, on a building costing up to a million dollars, may roughly be taken to be a force of four or five,—superintendent, assistant superintendent (or "job runner," as he is sometimes called), timekeeper, material clerk, and stenographer; with the addition of an engineer, expediter, cost clerk, plan clerk and time and material checkers as the size and complexity of the operation increase, until on a building involving from ten to fifteen million dollars, a force of 20 or 30 may be legitimately employed in expediting completion of the structure.

Third. Under present practice, the majority of responsible builders execute not more than 20 per cent of the work with their own organizations. This will usually consist of the concrete work in the foundation, the masonry work, and the rough carpentry. These items play so important a part in the progress of the building that it is essential that they be under the direct control of the general contractor. Bids are taken on all materials entering into this work, and there is left, therefore, only the actual cost of the builder's own labor as a non-competitive element.

Fourth. The remaining 80 per cent consists of subcontracts and equipment purchases, awarded after intelligent competition among carefully selected bidders in each trade. These bids are tabulated and submitted, with the builder's recommendation, for the approval of the owner and architect before any obligation is incurred. The owner, however, is free to designate any subcontractor or material purchase he may favor, and, should the amount be higher than the figure recommended by the builder, the guaranteed limit would be increased by that amount.

Fifth. Detailed estimates of all proposed changes and extras are submitted to the owner and architect for acceptance. If approved, an architect's authorization is issued to the builder, increasing the upset price by the amount of the estimate. In this way, an owner is kept constantly aware of the money value of his decisions, and has the satisfaction of knowing that he will be called upon to pay only the actual cost of their execution. Thus one of the most constant sources of friction and irritation between owner and builder is removed, and a decision which,

under a lump-sum contract, might involve days of wrangling and subsequent delay, can be had at once.

Sixth. Reimbursement to the builder, together with a proportionate share of the fee, may be made monthly or, where a building is financed by means of a mortgage bond issue, at certain specified stages in the erection of the structure. In either case, the builder will have to support the amount of his application by receipted vouchers, invoices, payrolls, etc., in an amount equal to or in excess of the amount of his application, before any further payment is made.

How, then, does this work out in practice? The writer has in mind a building, costing around five million dollars, recently completed to the entire satisfaction of the owner, architect and builder,—a happy combination rarely achieved under the competitive form of contract. The builder was called in shortly after the selection of the architect and when there was nothing more than the sketch plan of the building. From these sketches and memoranda specifications, a preliminary estimate was made, to give the owner an idea of his commitments and to guide the architect in the execution of the plans. The architect availed himself from the outset of the practical knowledge of the builder, and in close collaboration the main structural features of the building were decided on and the excavation started. As soon as the scheme was sufficiently developed to permit complete structural steel plans to be made, figures were taken and a contract for fabrication let. Had it been necessary, as in the case of a lump-sum contract, to await the completion of the final plans and specifications before the letting of even the general contract, a loss of time amounting to between two and three months would have been inevitable. As it was, in view of the close collaboration from the beginning between all parties concerned in the financing, designing, erection and operation of the building, the risk of radical changes in the steel design was slight, and the owner was compensated for such minor changes as were called for in the working out of the detailed drawings, by a much earlier completion date.

The advantages resulting to the owner from such a contract as here described may be summed up as:

First. Saving of valuable time in starting the work and securing a much earlier completion date.

Second. Economics in construction, which unquestionably resulted from the combined knowledge of the architect and builder.

Third. Complete knowledge on the part of the owner of every measure taken for the advancement of the project, with the interest of all parties enlisted.

Opposed to this picture is another which was recently brought to the writer's attention. A small but sound banking institution in the west decided on the erection of a new home office to house its growing needs. A certain sum of money was set aside for the purpose, and a nationally known architect engaged to draw up the plans. He produced a scheme which seemed in every way to meet their requirements, at a cost, he assured them, that would not exceed the amount of their budget. On his advice, in order to save time and to take advantage of prevailing market conditions, he was authorized to let certain contracts direct, before the selection of the builder was agreed upon. When bids were taken for the remaining portion of the work, it was found that the figure of the lowest bidder was almost twice what they had anticipated. There was no question that a creditable building, adequate to their needs, could have been erected within their budget. But it was too late!

From this it may well be seen that coöperation cannot start too soon; frequently it comes too late; often, alas, not at all,—and the owner is deprived of one of the most valuable forms of service that the builder can render. There is no substitute for the experience and mature judgment that the able builder will bring to the conference room, and it is here, just as much as in the field, that his knowledge of ways and means and the cost thereof will clarify the problem and help toward wise decisions. Let the owner, then, select his builder as he does his architect,—for his reputation for honesty and integrity; for the services his training and ability have qualified him to render; for his record of past and present achievements,—and make such an arrangement with him that his concern shall be enlisted solely in building wisely and well. In so doing the owner will sow the seeds for a most fertile and effective collaboration.

Residence at Valhalla, N. Y.
Mann & MacNeille, Architects
Built on Cost Plus Percentage Basis
Barr & Van Buskirk, Builders

ARCHITECTURAL USE OF CAST STONE

BY

JOSEPH B. MASON

THE chief obstacle to architectural use of cast stone in the past has been the difficulty architects have found in specifying this material. Adoption of standard specifications should remove this drawback. Thirty-four of the leading manufacturers of cast stone, art marble and similar products met during a recent conference of the American Concrete Institute at Philadelphia and agreed to form an Association of Cast Stone Manufacturers, the first task of which will be the establishment of standard specifications for cast stone. Another task of the new Association, we are told, will be the elimination of the confusing multiplicity of names now used to describe the various concrete stones on the market. So rapid has been the development of the use of cast stone and allied products in the past few years that we can hardly afford to longer ignore the fact that for certain purposes and under certain conditions their use is practical and desirable. There is a place for these products, and it would seem that those architects who have not already familiarized themselves with them should do so now, if for no other reason than that they desire to keep abreast of developments in the profession. Natural stone is and probably will continue to be satisfactory, but this fact does not preclude the development and use of interesting new cast stone products which have a wide range of uses. At least let us make ourselves aware of the possibilities that lie in their use.

One of the handicaps that manufacturers of cast stone have had to meet is the prejudice of some architects unfamiliar with the product, who regard it as imitation of natural stone and who, from lack of information, are not willing to believe that it has merit of its own. Many architects feel that there is only one reason why the use of cast stone should be considered, and that is its low price. This I do not believe to be true. There is a place and a use for cast stone on its own merits alone. The colors, textural effects and structural qualities of cast stone scientifically made are such as to meet an architectural need which, regardless of price, makes its use desirable. Then, too, there are instances where a particular color or quality of stone is required for a particular use at a time when other surfacings meeting these qualifications are absolutely unobtainable.

I have in mind an architect who wanted to use a certain buff sandstone on winter work which it was imperative be rushed to completion. The quarries from which this stone could be obtained were closed, and it was impossible for him to get it at any price. Here was a case where he was forced to call upon

Cast Stone Facing and Trim, Pasadena Public Library

Myron Hunt, Architect

Intricate Design in Cast Stone, Fine Arts Building, San Diego
Templeton, Johnson & Snyder, Architects

the makers of cast stone. He got in touch with a manufacturer who studied the problem and prepared a variety of samples. Absolute control of color and texture made it possible for the manufacturer, coöperating with the architect, to produce a cast stone of the exact nature desired, at a cost somewhat under that of the product which the architect had been making such a strenuous effort to obtain. It was no reflection on the competing material; it was, however, a demonstration of the triumph of man's ingenuity over nature and the barrier she has long maintained. Coöperation with architects is activity which forward-looking manufacturers of cast stone have encouraged in recent years to their advantage. The larger and more reliable companies now maintain drafting departments and consultants with a thorough understanding of architectural detail to render service to the architect and builder. This department assists in the selection of design of the various types of units. It assists in the preparation of estimates, in the taking of measurements incidental to the designing of special pieces, in the preparation of samples, of large scale drawings correctly interpreting the architect's plans, and in many other matters. Clay models are made up to be approved by the architect, either by actual inspection or by photographs.

In fact, the making, marketing and placing of cast stone have become a very complex and scientifically controlled industry. The constant effort of several of the larger manufacturers who for more than 20 years have been striving to raise the standard of the industry and the quality of its products, has been largely responsible for its strength today. The years of experiment and trial have developed scientific procedures which leave very little to chance. The careful selection of aggregates; the care in grading to secure utmost density; the crushing which is designed to give a cleanly broken or shattered aggregate rather than a pulverized material; the scientific application of thoroughly tested formulæ for both color and proportions; and in general the exactness and thoroughness of the entire process which places it on a high plane of mechanical perfection, make the cast stone products of today tangible, definitely known quantities which can be relied upon.

It is the men who are scouring the country for unique and beautiful natural stone to use as aggregates, who employ geologists and chemists as well as other competent technical men to assist them in making a stone which is in itself unique and beautiful, who interest me. In his heart no architect likes to or wants to imitate one material in another, and usually he will do so only when forced to for economy's sake. It can be done, as in the case I have mentioned, but it is not the aim of enlightened manufacturers to produce a cast stone that is merely an imitation. They realize that cast stone will not reach its highest development until it is recognized as a material having characteristics of its own of definite quality and capable of producing definite results both artistically and physically.

It is in the selection of the aggregates which they use in making cast stone that manufacturers are escaping the stigma of imitation. They search the country over and even hunt out the forgotten quarries of foreign lands in an effort to get stones. The result is that now they are giving us cast stone with colors and textures long ago given up by architects as being impossible to secure. A certain western manufacturer of cast stone recently employed a corps of geologists and conducted a minute search through a dozen states within shipping radius of his plant. In this search he found a number of natural stones with proper degrees of durability, hardness and texture, and what is extremely important, of proper color. He is now operating eleven small quarries which enables him to make cast stone of remarkably attractive color and texture. Many of the world's most beautiful natural stones, and those most desirable because of their durability and hardness, are no longer obtainable because of their scarcity or extremely high cost. Cast stone manufacturers are making a definite effort to supply architects with stone of this character. Igneous stones, occurring in broken or irregular veins so that they cannot possibly be quarried in pieces large enough for architectural use, are employed for this purpose. They are often taken from distant and sometimes almost inaccessible deposits, but the expense is justified in the quality and individuality of the product thus secured.

Much of marble as well as other expensive stones are obtained almost entirely from foreign quarries. They are selected for color and texture in addition

to the qualities which will produce a cast stone of strength and durability. Color is of course a very important consideration. The best cast stones are those which rely for their tints upon the natural color of the selected aggregates. Mineral pigments are used in small quantities to shade the cement mortar, but it is upon the natural hue of the aggregates that most cast stone relies for its colorful effect. Combining different shades of crushed stones or marbles according to formula, the producers obtain color effects which heretofore have been obtainable only in very rare natural stone.

To go into the extensive details of manufacture of the numerous forms of cast stone would convey a convincing picture of the care with which the products are made and would undoubtedly raise their standing in the eyes of architects who appear to believe that they are thrown together in a most haphazard manner. But such a description would be beyond the scope of this article. It will be enough for me to point out that the investment in machinery, equipment and buildings in a modern cast stone plant in many cases is in excess of half a million dollars, that the average for 200 plants is somewhat over $40,000 each. These companies, equipped as they are with efficient and complex machinery, take elaborate precautions in the selection and grading of the materials, in crushing, and in the final preparation and mixing of the concrete. Extensive systems of moulds, great curing rooms, and powerful finishing machinery are required. The largeness of the investment and the reputation which the manufacturers are building up slowly but surely, make it imperative that they supply reliable, satisfactory stone, and make them willing to stand behind the product with a guarantee that should please the most exacting purchaser.

One of the interesting characteristics of cast stone is its adaptability to receiving numerous surface treatments. After proper curing, the flint-like product may be tooled or dressed in the same manner as natural stone, or the surface may be treated with acid to give an exposed aggregate effect. The architect may decide upon a particular color and textural surface, go to a manufacturer, and through coöperation with his service department perfect a stone which will exactly meet his requirements. Many of the manufacturers not only assume the task of perfecting a surface material which will exactly meet the need of any given work, but will assume the responsibility for installation. They will contract for the material in place and guarantee the installation.

I have said that cast stone has certain merits that make it desirable in itself, regardless of price. Before concluding I will outline some of its merits. First, I should say, is the close control of color and texture which enables the architect to specify the exact shade or finish he desires in a structure. Next in importance, possibly, is the fact that once the mould has been made, a given product may be turned out in great quantities at a constantly decreasing cost. That is, extensive ornamentation which calls for a repetition of a single pattern is possible at very low cost. From one mould hundreds of pieces may be made. Another excellent quality of cast stone is that it may be reinforced with steel so that it will carry a structural load while at the same time retaining its architectural value. The units are easy to handle, due to the fact that metal-carrying rings are embedded in the concrete before it sets. These rings are so arranged that when the unit is supported by cable it hangs at the exact angle at which it is to be placed. Cast stone may be made into most difficult patterns and shapes without incurring excessive expense, and it may be cast in thin, flat slabs of a size entirely impractical in natural stone. A piece having extreme projections in two or more dimensions may be constructed with comparative ease, whereas to carve such a pattern would require much labor and a block of enormous proportions. Another practical feature of cast stone is that individual units may be duplicated at any time, since both moulds and formulæ for color and texture are indefinitely preserved by the manufacturer.

Exterior Facing and Ornament of Cast Stone, Valhalla Memorial, Burbank, Cal.
Kenneth McDonald, Jr., Architect

The willingness of the manufacturers of cast stone to keep abreast of the most advanced architectural practice of the day is doing much to increase the use of their products. More than 20 years of development have given us these materials in a form which has been quite thoroughly tried and tested. The increasing emphasis on well executed architecture, significant decorative detail, and on color and textural effect, brings to the profession a need for such a product which is entirely logical and worth while.

STUCCO EXTERIOR, TRIM OF CAST STONE
HIGH SCHOOL, HEALDSBURG, CAL.
W. H. WEEKS, ARCHITECT

CAST STONE ENTRANCE DETAILS
HIGH SCHOOL, GLENDALE, CAL.
J. C. AUSTIN, ARCHITECT

NEW EFFECTS FROM COMMON BRICK

BY
R. S. TILDEN

THE past few years have seen a rather remarkable revival of architectural interest, as well as public appreciation, of common brick as an exterior facing material. Whatever may be the real reason, the fact remains that brick is, especially in the larger building centers, steadily becoming more generally used as a facing material. One of our prominent authorities has recently said that "there is no sound architectural reason why a building should not be brick from ground to roof." The underlying thought is that modern design, in its treatment of mass, tends toward the use of one material, and that brick is sufficiently flexible to permit the expression of individual ideas. It is possible that the examples commented upon in this article may offer suggestions to those interested in accomplishing such a result.

Foreign Brickwork Design. There is at this writing a very comprehensive exhibit of foreign architectural photographs on tour of the country, and the reception accorded this collection in such representative centers as New York, Chicago, Detroit, Cincinnati, Philadelphia and Boston is very conclusive evidence of the appreciation of its value to the architectural profession. Two examples are illustrated here, the first of which is the crematory of the city of Hanover (Fig. 1). While the principal interest to some may lie in the handling of brickwork in the mass, certain of the details of the masonry treatment deserve attention,—that over the doors, for example. The surface is broken by a gable-like treatment, and although each unit projects beyond that next below, all are set back from the face of the building sufficiently to give emphasis by deep shadows. The courses of brick in these projections are at an angle of 45° to the horizontal, while the courses in the cornice and similar points are laid vertically.

The bridge in the city of Hamburg (Fig. 2) shows a rather unusual treatment in the courses just below the coping. The header brick introduced into this basket-weave bond are cut out to a point. The curve of the abutment not only adds to the pleasing character of the design but shows the practical possibility of using curved walls, etc., laid to a comparatively short radius.

Rowlock Courses. The use of brick laid rowlock, or on edge, is not new but offers an opportunity for securing effects differing greatly in the matter of scale from brickwork laid in the usual manner. The bond in the example illustrated (Figs. 3 and 5) is the ordinary Flemish, with a rather wide "rough cut" joint which lends a distinct character to the surface. The entrance door detail shows that not only may

Fig. 1. Crematory at Hanover
Konrad Wittman, Architect

Fig. 2. Bridge at Hamburg
Fritz Schumacher, Architect

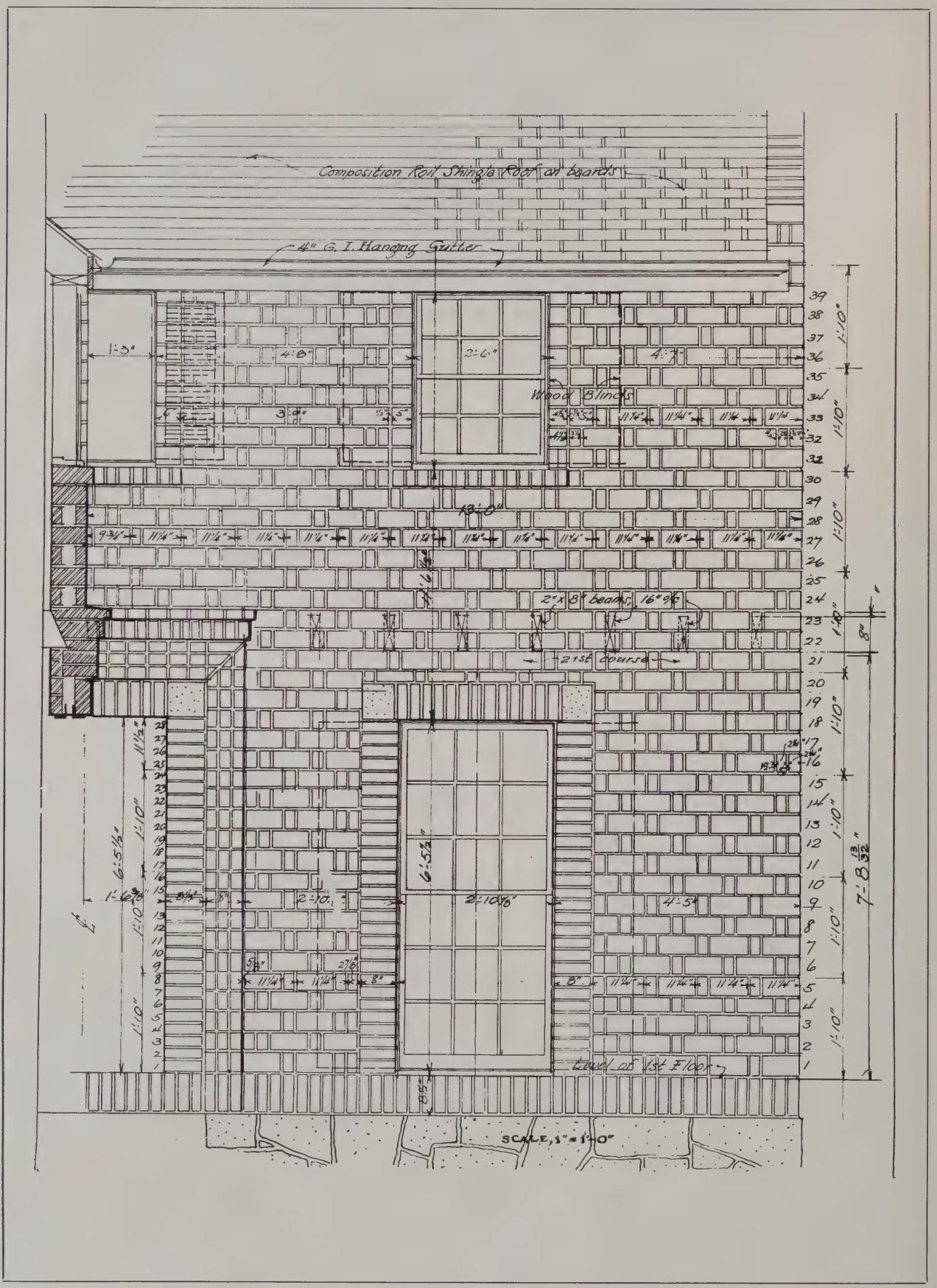


FIG. 3. DETAIL OF BRICKWORK SHOWN IN FIG. 5
HOUSE AT DOBB'S FERRY, N. Y.
THEODORE A. MEYER, ARCHITECT

Fig. 4. Chimney Detail
Grosvenor Atterbury, Architect; John Tompkins, Associated

Fig. 5. Entrance Detail
Theodore A. Meyer, Architect

the wall surface prove attractive but that handling of simple projections may produce good results.

Chimney Decoration. The original conception of chimney brickwork serving simply as a protecting and enclosing material for flues is not universal, if some of the accompanying illustrations (Figs. 4, 6 and 7) may be considered evidence. That showing the central flue supported by two flues of circular shape indicates, at first glance, the use of specially shaped brick, but it is both possible and practicable to secure the "spiral" effect simply by projecting adjoining brick on successive courses. The chimney illustration (Fig. 7) showing the niche and the pattern work in the upper part offers a rather interesting sidelight on the frequently heard derogatory remarks as to present-day building trades workers. The bonds and patterns used in the chimney (and in the terrace floor as well) were only sketchily indicated on the details, the idea being to secure the interest of the workers by permitting them to choose the patterns to be laid in the various rectangles. The scheme was successful in obtaining better coöperation between designer and mechanic, not only insofar as this part of the building was concerned, but for the entire work. It might be noted here that the radius of the circular columns is 12 inches and that they are built up by first cutting individual brick in the form of a segment and then laying the column all headers. A help in reducing time required will be found in building a form of wood or other material whose inner diameter corresponds to the outer diameter of the finished column. The brick and mortar can then be laid within the form, one course high and, after setting, the entire course laid as a unit in the column. This same illustration shows, at the eaves of the gable wall, the introduction of "cut" or "splintered" brick, and a somewhat similar idea has been carried out in all of the walls. This is another instance where the exact design and location of these inserts were left to the fancy of the mason, who was not asked to follow any set pattern or to accept any predetermined spacing. The latitude allowed the bricklayer proved profitable in not only securing his coöperation, as already said, but also in doing away with constant measurement and reference to detail drawings, thereby conserving time and reducing cost.

Skintled Brickwork. This type of wall has possibilities for a wide variety of effects, two of which are shown in these illustrations (Figs. 8 and 9, and Figs. 10 and 11). In the first the face is laid in common bond, and little if any effort is made to secure a uniform type of joint. The individual brick are set at irregular distances from the normal face of the wall, the projections varying from flush to plus ¾ inch and the recessed brick from flush to minus ½ inch. In the second illustration the effect is very different, only certain selected brick departing from the usual procedure of being laid "to the line." In this case the projections vary from flush to plus ⅝ inch, none of the brick being set back of the face. It might be noted that both of these examples of brickwork are in the same locality and built with the same kind of brick and mortar. The difference in texture was accomplished simply by using different types of skintling. Other variations may be obtained by neglecting to strike or tool the mortar joints and by allowing the excess bedding mortar squeezed out by "shoving" the brick to permanently remain adhering to the face of the wall.

It has been the custom for many years to set lines

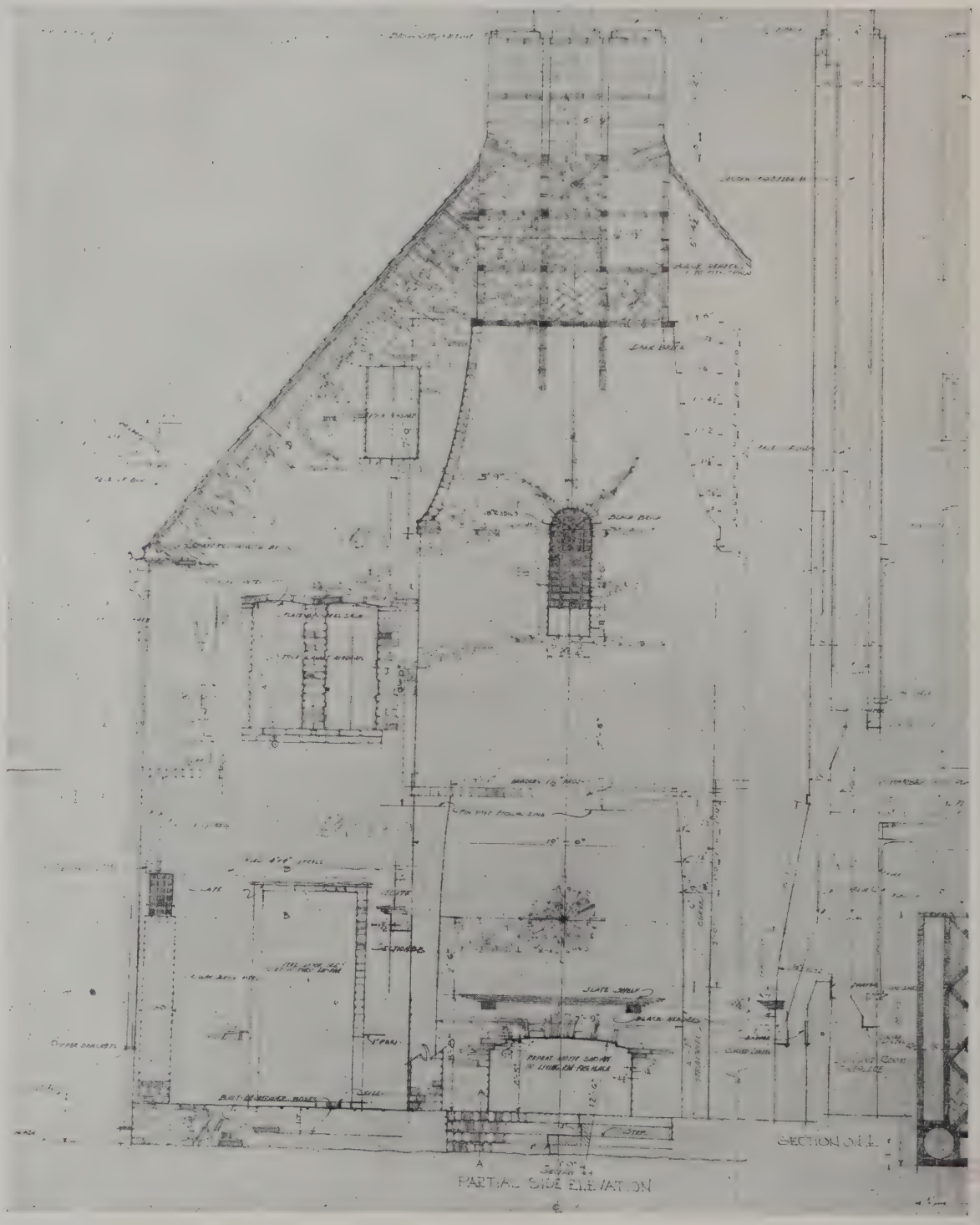


FIG. 6. DETAIL OF BRICKWORK SHOWN IN FIG. 7
JOHN T. BRIGGS, ARCHITECT

Fig. 7. Variety in Brick Texture
John T. Briggs, Architect

Fig. 8. Skintled Brickwork
S. S. Beman, Architect

for building brickwork with relation to the face of the wall and to make all measurements from this face line. If this method is followed and measurements made for individual brick in erecting skintled walls, the cost will be prohibitive. Lines for this type of wall should be placed at the back line of the wall, which is carried up plumb, and the facing brick set approximately as shown. Do not allow measurements for projections, etc., to be made except by eye. If this suggestion is faithfully followed, the cost of laying skintled walls will not be any greater than that for constructing what might be termed ordinary walls,—that is plumb, with level courses and joints struck one side.

Carved Brick. Such brickwork offers such a wide range of possibilities in connection with the decorative details of buildings that it could well be classed as something apart. The coöperation of architect and carver is, in many cases, closely indicated, and it may be that construction men or mason foremen could be of real assistance in suggesting practical ways of accomplishing desired results. One designed by the architect and executed by bricklayers, indicates some of the possibilities. It is built of the ordinary brick, those in the sails of the ship laid flat (4-inch side out) and the rest on edge, (Fig. 12). Joints were as indicated on the drawings. The carved head is simple, and was done with small chisels by the mason. The white water effect was secured by using a white cement mortar for the brickwork representing the waves under the bow of the ship. The mast, masthead decoration and pennant were of mortar. Both this and a companion figure, representing the stern of the ship, were part of the regular construction contract and were executed by bricklayers forming part of the contractor's regular organization.

Fig. 9. Detail of Brickwork Shown in Fig. 8

The examples shown here, illustrating modern work in design and brickwork, are naturally but an infinitesimal fraction of those existing. Probably the most convincing demonstration of the interest this material holds for present-day designers could be had by looking out of windows in the upper floors of the taller buildings in any city and noting the many examples of decorative brick detail in buildings erected in recent years. To one familiar with the trend of architecture in a given city, it is possible, by noting the materials used to secure decoration, to name with a fair degree of accuracy the date of construction. One man noted for the excellence of his brickwork recently remarked that if designers would devote

Fig. 10. Detail of Brickwork Shown in Fig. 11
Russell Walcott, Architect

Fig. 11. Skintled Brickwork
Russell Walcott, Architect

more careful and conscientious effort to brick detailing, the time would be well repaid, resulting in more artistic buildings and lower costs to clients.

A building now under construction in the Grand Central zone of New York is a forerunner of what we may expect to see in the yet-to-be-built commercial buildings of America. In this particular design the facade above the second floor presents the effect of a series of parallel vertical planes. These are emphasized not only by the varying depth of projections but by a selection for shade of the brick used. This results in one vertical plane providing a contrast by the use of darker brick, while the adjoining plane uses brick of a somewhat lighter shade.

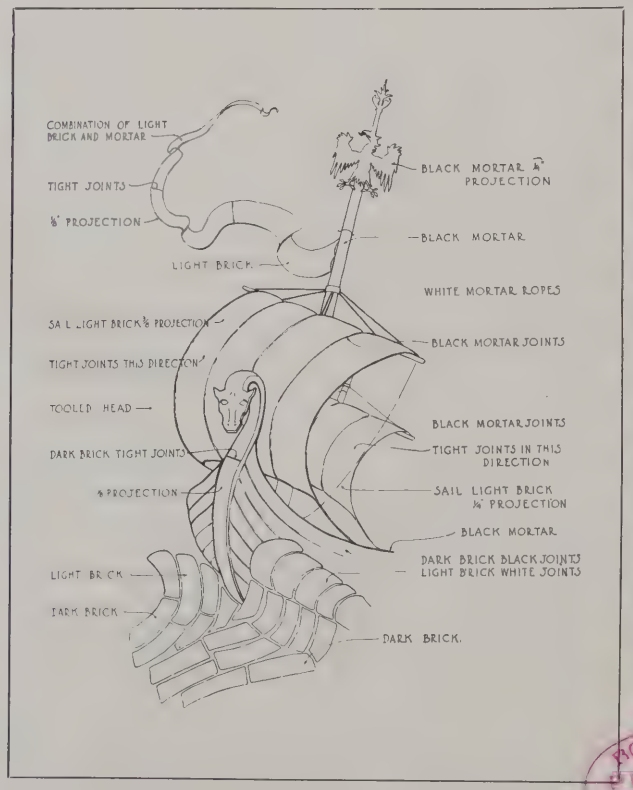


Fig. 12. Detail Used by Bricklayer in Executing Ship Design

Fig. 13. Ship Design, Simply Executed
John T. Briggs, Architect

BETTER STUCCO HOUSES

BY

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DURING the last decade use of the timber-framed stucco house has become established architecturally throughout the United States to a very wide extent. There are several very good reasons for the development of this type. It is comparatively low in first cost, and also in final cost, if correctly and carefully built. Architecturally and structurally it lends itself readily to the interpretation of a number of charming types of domestic architecture, notable among which are the English half-timbered cottage, the Spanish town house and farm house, the Italian villa, the Moorish house of north Africa, and the adobe pueblo structure of the southwest. By the incorporation of certain features in its structural design, at a comparatively slight additional expense, such a house may be made practically earthquake- and hurricane-proof. By their very nature, its exterior walls are fire-resistant to a considerable degree; and if care is taken with the stucco coating, its first cost will be its only cost; there should be no need of applying, later, paints or other preservative coatings in order to render it leakproof.

Because of its many desirable features, the demand for this type of house will increase to an amazing extent. The invested capital which it represents, large as it is at present, will amount to an enormous sum. Therefore, any structural details that will add to its life, whether it be exposed to freezing atmosphere, excessive rain, fire, severe earthquakes or hurricanes, should be of vital interest to architects, home owners, insurance companies and bankers. It is the purpose of the writer to outline how present building practice may be improved, so as to make the timber-framed stucco house more resistant to the severer exposures, and longer lived under ordinary conditions. These remarks will apply only to dwellings from one to three stories in height. No attempt will be made, nor is it necessary, to set forth comprehensively and in detail, the complete structural plans and specifications for such a house; instead, critical requirements will be outlined and discussed under the headings: (1) Foundations; (2) Framing; (3) Chimneys; (4) Stucco Covering.; (5) Roof Covering. The present article will deal with foundation and framing; a subsequent article with the three remaining subjects. The very severe earthquakes that occurred in 1927 in the Crimea, and more recently in Bulgaria and Greece, remind us of the ever-present earthquake hazard. In the Bulgarian earthquake more than 100 persons were killed, and more than 600 injured. The complete ruin of more than 13,000 buildings left about 295,000 people homeless. In the vicinity of Yalta, in the Crimea, more than 75 per cent of the buildings were completely demolished. On an average, about 50 destructive earthquakes occur every year throughout the world, and their location is not limited to foreign countries. It therefore behooves wise and provident architects and investors to build accordingly.

Foundations; Essentials for Resistance to Earthquakes. The reliability of the foundation being of prime importance, it is the first matter that requires consideration. The term "natural foundation" will be used here to designate the character of the terrain in which the excavation is made for the concrete foundation. Types of natural foundation are sand, clay, gravel, sand and clay, sand and gravel, gravel and clay, loam, mud, and the various kinds of solid rock in place. Solid rock in place is of course the best natural foundation for a structure in a region subject to severe earthquakes, because solid rock vibrates only elastically during an earthquake, by which is meant that the rock does not usually suffer a permanent dislocation as a result of the shock. Furthermore, the amplitude of vibration or amount of the swaying of solid rock is less than for any of the looser materials. During severe earthquakes a building that rests on loose sand, alluvium or river bottom sediment, marsh, or deep recent fill, such as frequently occurs on building lots as a result of street grading operations, will be violently shaken and may be permanently dislocated. Even if the frame remains intact, much damage to plastering and brick chimneys is likely to occur unless special care be taken in the design of foundation and chimneys.

Of course, for well known and obvious reasons, the areas of the different parts of the concrete foundation in plan should always be carefully arranged by the architect so as to be proportional to the vertical loads distributed over them. This is particularly necessary for foundations in the looser soils, such as marsh and alluvium, so that unequal settlement of the building, as the result of a strong shock, will be minimized. In the majority of cases a natural foundation of solid rock does not occur on the site at a reasonable depth for the type of structure under consideration. A large number of the residences in many cities must be located on talus slopes, alluvium or made ground. In order to reduce the earthquake risk to a minimum, when building on hazardous natural foundations such as these, certain precautions should be taken:

1. The natural foundation should be kept as dry as possible by drainage, wherever that is feasible. The value of drainage in reducing the susceptibility

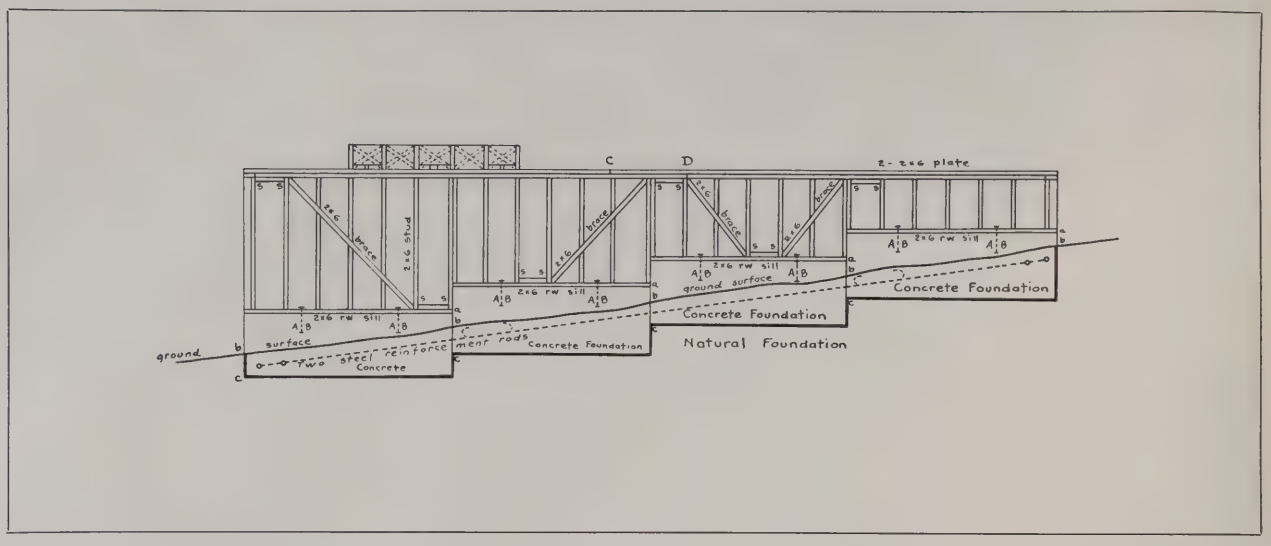

Fig. 1. Properly Braced Underpinning on Reinforced Stepped Foundation, with Anchor Bolts

of a soil to vibration is very great. The opportunity to drain a soft wet foundation for a house in a region of seismic disturbances should never be neglected.

2. The bearing pressure of the soil should be made very low; for example, one ton per square foot for foundations 3 feet and less in depth; one and one-half tons per square foot for foundations of more than 3 feet in depth. Since both the weight of this type of house and the magnitude of the loads applied within it are comparatively small, this requirement will not lead to excessive dimensions for the concrete foundation.

3. The foundation should be made deep. For example, assuming a flat alluvium site on which it is proposed to erect a residence of some size and cost, if the concrete foundation reaches to a depth of 6 or 8 feet in the alluvium, the building will be shaken much less violently than if the concrete goes down only 2 feet. Since in localities of soft clay it is necessary to place the base of the concrete foundation below the frost line, which, in the northern states ranges from 3 feet ordinarily to a maximum depth of 6 feet in extreme cases, this suggested depth of 6 or 8 feet, in order to reduce earthquake effects in treacherous regions, is not an excessive requirement. In order to gain the added bearing power that accrues from going to a greater depth with the concrete foundation in a soft natural foundation, the actual area on which the concrete bears must have its lateral support balanced, either by material superimposed to the same height on each side, as shown in Fig. 5, or, if the entire basement is excavated, by a reinforced concrete floor capable of resisting the conjugate upward pressure necessary for such lateral support, as in Fig. 6. The greater the bearing power of a natural foundation, the less disturbance will it suffer during an earthquake. For this reason, depth of concrete is desirable for a foundation in soft material. Where the depths differ on two sides of a concrete foundation, as in Fig. 7, the smaller of the two depths determines the bearing power.

4. The concrete foundation should be reinforced with some steel rods placed longitudinally. By thus enabling the concrete to bridge any soft spots in the natural foundation, this will tend to prevent unequal settlement, with its consequent damage to plastering. Such reinforcement serves also the important function of tying together the different parts of the concrete foundation, and would thus prevent the lower ends of the underpinning from spreading if the concrete should crack. The least amount of such steel for the shallowest proper depth of concrete is two $\frac{5}{8}$-inch corrugated rods, one placed 3 inches below the top surface of the concrete, the other the same distance above the base, since at different cross sections of the concrete longitudinal tension, due to unequal settlement, is as likely to occur at the top as at the base. For a concrete foundation ranging from 4 to 8 feet in depth, there should be two $\frac{3}{4}$-inch steel rods near the top, and two near the bottom. The rods should be overlapped at least 2 feet; their ends should be hooked into 180-degree bends, 6 inches in diameter. The overlap should not be placed at the corners of the foundation, but the rods should be bent around the corners of the foundation so that approximately the middle of the length of the rod is at the corner.

5. To prevent sliding during an earthquake, the excavation of the natural foundation should be stepped wherever the site is sloped, as illustrated in Fig. 1; the excavation should not be sloped as shown in Fig. 2. Another particularly precarious type of natural foundation is deep clay on a steep hillside watersoaked with seepage. Complete under-drainage and deep stepping are absolutely essential, because numerous are the instances in which houses on such foundations have slid, even in the absence of earthquakes.

Fig. 1 illustrates the minimum concrete foundation requirements for an earthquake-resisting two-story house located on a well drained compact sand-and-gravel natural foundation in a region where

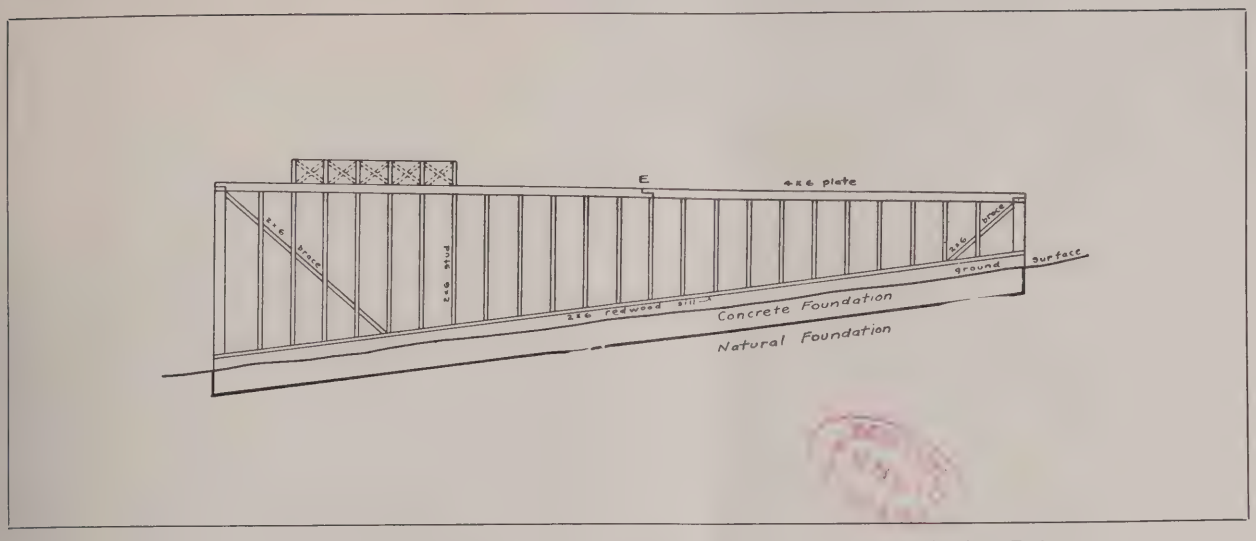

Fig. 2. Poorly Braced Underpinning on Sloping Foundation, without Anchor Bolts

neither freezing temperature nor hurricanes are likely to occur. To prevent decay of sill and base of underpinning, the vertical distance, *ab,* should be made a minimum of 8 inches; *bc* should be a minimum of 15 inches. If the natural foundation is clay or adobe, whether slightly sloped or level, it should be drained by surface trenching and sub-surface tiling, and *bc* should be between 24 and 36 inches, so that the base of the concrete will rest on a material of nearly constant moisture content. Depth here is important, because changes in moisture content of clay and adobe soils produce such large expansion and contraction, with consequent heaving of the building, that the plastering may be badly cracked. The permanence of a good stucco coating depends on the immovability of its backing.

Where a large amount of concrete will be required for the foundation, the architect should procure samples of the available local sands and crushed rock or gravels, and determine what mixture will give the most economical concrete that has the required strength and water-tightness. The best practice in this regard may be found outlined in a number of publications: (1) "Design and Control of Concrete Mixtures," published by the Portland Cement Association; (2) *Proceedings of the American Society of Civil Engineers,* October, 1924. Where only a small amount of concrete is involved, less precision may be used in proportioning the ingredients. Each cubic yard of set concrete should contain at least five bags of Portland cement. The least amount of mixing water should be used, consistent with ease of tamping the concrete in the forms. The sand and coarse aggregate, whether it be crushed rock or river gravel, should be hard, clean, well graded in sizes, and free from dust, clay or loam. Before adding the cement, these should be mixed thoroughly dry in the proportion of 1 of sand with about 2 of coarse aggregate, as measured by volume loose. The set concrete should be kept moist for at least one week after pouring.

At intervals of about 4 feet, ¾-inch bolts, 12 inches long, should be imbedded vertically in the concrete foundation, as shown at *AB* in Figs. 1 and 4, to provide for anchorage of the sills, which should be drilled to engage these bolts, and tightly bolted with nuts and washers. This anchorage is required because in many instances frame houses have been shifted laterally from the top of horizontal concrete foundations where the sills were not so anchored. In addition to anchorage by bolts, the sill should be kept from sliding longitudinally along the top of the concrete by having alternate short lengths of sill of, for example, 4- or 6-foot lengths, depressed into the concrete for a depth of about 6 inches, as shown in Fig. 4. It is very inexpensive to pour in the concrete to these different levels. If this is done on all sides of the building, and if the concrete foundation has been reinforced, as was previously recommended, sliding of the superstructure from the concrete foundation cannot occur. The non-sliding advantage of a sill, thus bolted and depressed at intervals in the concrete foundation, is assured only if the concrete foundation is reinforced with steel rods. Obviously, the frame of the house should be as securely anchored to the sill as the sill has been anchored to the concrete foundation, the sill thus serving as the structural connecting link between frame and foundation. This can be accomplished most effectively by the use of diagonal sheathing, because "toe-nailing" of underpinning to sill, as commonly practiced, is of doubtful structural value. In order to have ample nailing area, between diagonal sheathing and sill, the sill should be 3 inches thick by 6 inches wide, when the house is taller than one story. A 2 by 6-inch sill is sufficient for a one-story house.

If the basement space is not devoted to any type of occupancy, 2 by 6-inch timber corner crossties at all corners of the foundation, nailed against the top face of the sill, also against the bottom face of the plate or cap of the underpinning, will add greatly to the tenacity and rigidity of the building as a struc-

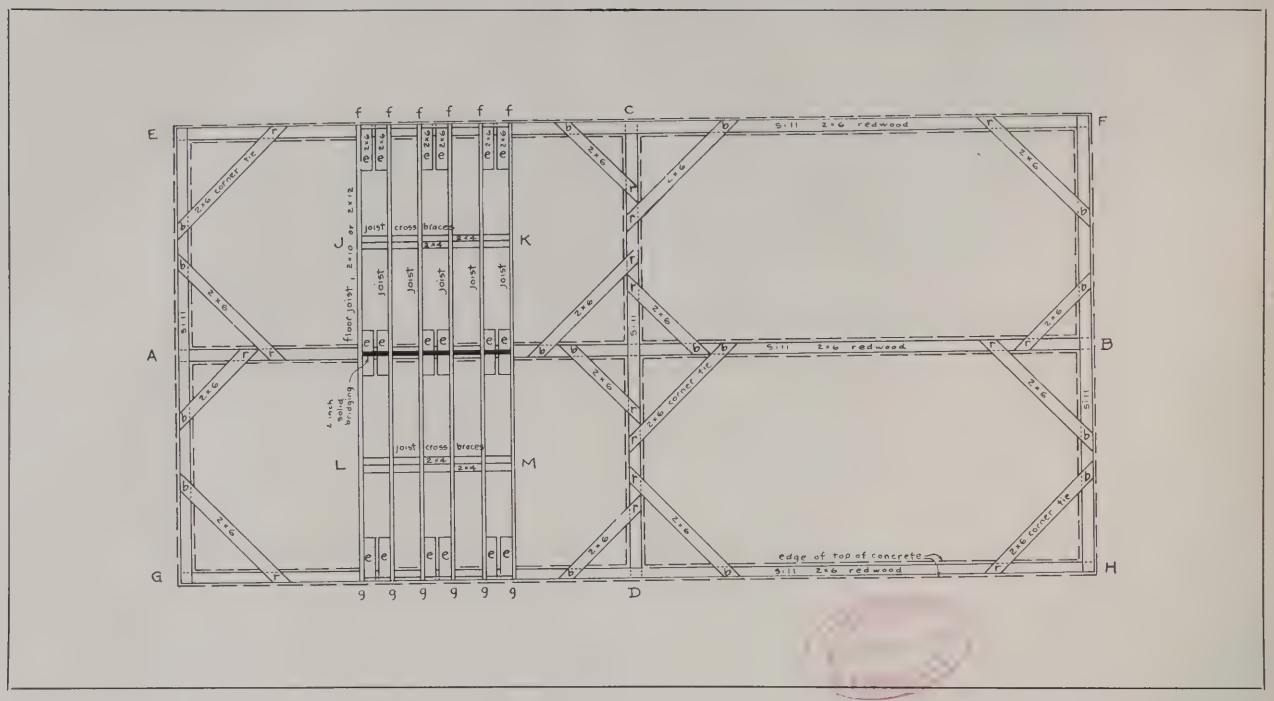

Fig. 3. Corner Ties for Sill and Plate Underpinning. Method of Attaching and Bracing Floor Joists

ture. Such timber corner crossties are illustrated in Fig. 3. To make them efficient, at least five 20-penny spikes should be driven at each joint to sill or cap. The crossties must first be drilled to receive these large nails, as otherwise they will be split, and thus practically worthless for the purpose intended.

Foundations; Essentials for Resistance to Hurricanes. It has been estimated that the maximum velocity of the wind in both the Florida hurricane of September 18, 1926, and the Cuban hurricane of October 20, 1926, was about 125 miles per hour. For safety in storms of this magnitude, buildings should be designed for a wind pressure of 30 pounds per square foot of flat vertical surface exposed; a design pressure of 20 pounds per square foot is too small. This was one of the definite conclusions reached as a result of the examinations made after these storms. In an earthquake, other factors being the same, the horizontal force exerted by a building on its foundations depends on the dead weight of the structure. The heavier the structure, the greater is this horizontal force. Because of its comparatively light weight, the timber-framed stucco house has a great advantage over a brick house in this regard. But in a heavy wind, the horizontal force exerted by a building on its foundation depends on the surface area exposed to the wind. Therefore, because of the light weight of its superstructure, the foundation of a timber-framed stucco house exposed to hurricanes must be made heavy enough to anchor the building against both sliding and overturning. To reduce the tendency to overturn, tall and narrow buildings should be avoided. Where the natural foundation is good, a minimum depth of 30 inches is recommended for the concrete foundation of a one-story house where severe hurricanes occur. This should be increased to 48 inches for a three-story structure. Furthermore, there should be incorporated all the details previously described as desirable in foundations for resistance to severe earthquakes, such as: (1) drainage of natural foundation, (2) stepping of excavation in natural foundation, (3) bolting of sill to concrete, (4) reinforcement of concrete, (5) depression of alternate short lengths of sill in concrete.

Framing Essentials for Resistance to Earthquake and Hurricanes. Some of the structural features required in the framing of a building for resistance to earthquakes are the same as for resistance to hurricanes. There must be a structural frame. All parts of the frame must be securely tied together. The frame must be very rigidly braced against horizontal thrusts in every direction. In addition, for resistance to hurricanes, the wind must be kept out of the building, This means that special protection must be provided for all openings, and that both the integrity and anchorage of exterior walls and roof must be assured. The tying and bracing of the parts of the frame are so important that particular attention should be paid to the structural details that are most effective for this purpose. Methods that should be employed will now be outlined under the headings: Underpinning, Floors, Exterior Walls, Roof. Several of these topics will be considered later.

Underpinning. In buildings of the limited height under discussion here, the bracing of the underpinning is of vital importance. There may be very serious effects of the collapse of the underpinning during a severe earthquake, because of inadequate bracing. It is of equal importance that the top of

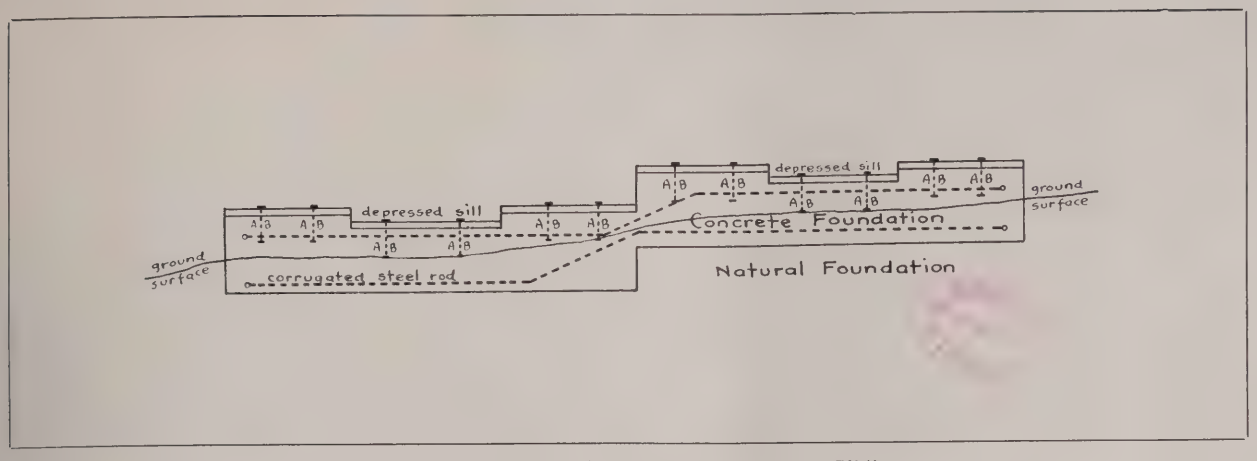

Fig. 4. Sill Depressed in Segments to Prevent Sliding

the concrete foundation be sufficiently high above the ground surface, so that the bracing of the underpinning, originally sufficient, does not become ineffective in time because of decay, due, for example, to gophers' piling up earth against the bracing. The sill should be of decay-resisting timber, such as redwood or red cedar.

For a one-story house, the underpinning should consist of 2 by 4-inch pine or fir studs placed 16 inches center to center; the underpinning of two- or three-story buildings should be 2 by 6-inch studs at the same spacing. All diagonal braces should be of the same sizes as the studs. The diagonal braces should be arranged as shown in Fig. 1, rather than as shown in Fig. 2, which illustrates common practice. The increase in rigidity, thus obtainable at a trifling increase in cost of labor, is very great, as analysis will show. In Fig. 1, note that the diagonal braces are continuous rather than broken between studs, as in Fig. 2; that their ends are double-mitered to blunter angles, which makes these ends stronger in compression than the ends of the braces in Fig. 1, which are only single-mitered; and that there are timber stays, marked as in Fig. 1, of stud size, which can be made very easily and effectively to take up the compressive stresses in the diagonal braces. The stays should be wedged with driving fit between the studs and should be attached to plate and to sill with ten 20-penny nails in each stay. The stays must be drilled to receive these large nails since, otherwise, if they are split by the nailing, their resistance is practically nullified. Assuming the common practice of using three 12-penny nails at each joint of the diagonal braces in Fig. 2, the underpinning, as braced in Fig. 1, can withstand a horizontal earthquake thrust at the level of the plate, that is ten times the safe similar thrust for the underpinning, as braced in Fig. 2. The underpinning of each side of the house should have at least two diagonal braces sloping in each direction, as shown in Fig. 1. The plate of the underpinning should be double, so that long splices, such as *CD*, will permit of sufficient nailing to produce tensile continuity in the plate. With continuity in the plate, the diagonal braces may be placed wherever the absence of openings permits, but preferably not at the ends of the wall, as in Fig. 2. A single-piece plate, spliced as at *E* in Fig. 2, is practically devoid of continuity in tension. Where a building is very long in plan, a transverse foundation, such as *CD* in Fig. 3, supporting a line of braced underpinning, is very advantageous to prevent bulging of the exterior walls at *C* and *D*, due to horizontal thrusts of hurricane or earthquake origin, as it is an efficient reinforcement.

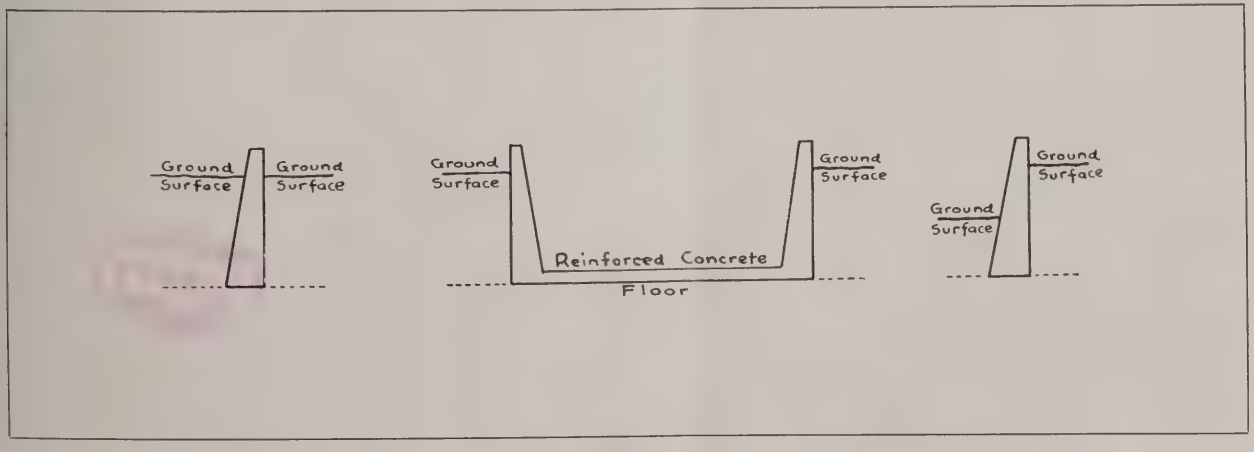

Fig. 5 Fig. 6 Fig. 7

THE STRUCTURE OF INDOOR TENNIS COURTS

BY
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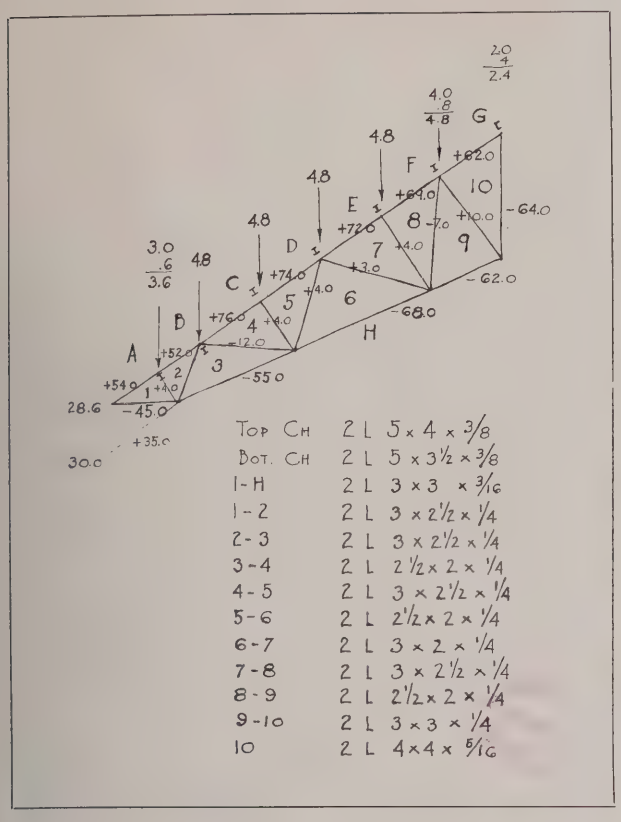
SINCE about 1900 a new type of structure has been developed to meet the requirements of complete shelter and protection for full-sized tennis courts, more than a score of which have been built and others planned for country estates and at high class pleasure resorts,—many on or near the Atlantic coast from Florida to Montauk Point. They have become much more elaborate and complete than mere roofs and walls enclosing playing spaces with ample clearance for full-scale operations. Besides affording commodious arenas for players and spectators, they often provide, usually in wings or extensions, lounges, dressing and toilet rooms, shower baths and other conveniences, and frequently swimming pools, making altogether complete equipments, involving expenditures that may reach from a minimum of about $80,000 to several times that amount.

The essential requirements for all tennis court buildings are an unobstructed, fully enclosed and well lighted area about 50 feet in height by a minimum of about 60 by 120 feet for a 36 by 78-foot standard court with a satisfactory, durable, level playing floor, and reliable first class heating and ventilating systems. As a tennis court is essentially a luxury, usually provided for the pleasure of wealthy owners and their friends and not required to produce financial returns or be limited by strictly economic considerations, it follows that the style, arrangement, equipment and details vary widely with the taste and fancy of the owner, local conditions and the personality of the architect, thus not only permitting but insuring wide variations of construction and equipment, so that no specific types of framing, plan, dimensions or equipment have been generally adopted. Each new building is generally of a new and distinct design. Generally, the longitudinal axis of the building is east and west, dressing rooms are on the north side, wall illumination on the south side, and skylights are in the roof above the whole playing area, those with a southern exposure generally being painted or whitewashed to prevent excessive glare. Owing to the considerable roof span required and the corresponding length of longitudinal bays, it is difficult to construct a satisfactory wooden framework with the usual truss forms, and even if one were built, the weight and fire hazard would be excessive; the bulk would be a serious obstruction to light and would be likely to give a heavy, clumsy effect. The newer form of truss that is a segmental arch made up of a network of short lengths of wood and having steel tie-rods to take the thrust, might be adopted. Such a roof structure was employed at Houston to house the recent Democratic Convention. However, the tie-rods might interfere with the playing, and the problem of skylighting would be serious. The latter problem might be eliminated if clerestory lighting were employed.

One of the covered tennis courts was designed by Warren & Wetmore for Harry Payne Whitney. It has high and heavy reinforced concrete walls, which on all sides are integral at the top with the lower part of the pitched roof which forms an eccentric cantilever structure enclosing an open rectangular space over the court and supporting there a double-pitched large skylight. Recently, from designs by the same architects, there has been built for Marshall Field a steel-framed tennis court building with eight transverse bents having their tall vertical posts in the side walls integral with the pitched rafters, both of plate girder construction; and the rafters of each pair are connected about midway between the eaves and the apex by adjustable horizontal tie-rods. The transverse bents are braced by light longitudinal wall and roof struts and trusses. This type provides rigid construction with riveted or bolted joints throughout, and is suggestive of church types.

Delano & Aldrich have designed some of the recently built structural steel tennis courts for Henry Rogers Winthrop, Jr., for Harrison Williams, and for John T. Pratt, all of different types, and two of them have attached swimming pools. Mr. Winthrop's tennis court at Woodbury, N. Y., is about 130 feet long, 51 feet high and 67 feet wide over all, exclusive of the porch, 16 feet wide, on the south side. The steel framework weighed about 100 tons. There are eight transverse bents with vertical I-beam columns having deep riveted connections to the end vertical web angles of the light riveted pitched roof trusses, all of the members of which are pairs of angles with 2 to 5-inch flanges, and gusset plate connections. At the top chord panel points there are 12 lines of 7-inch I-beam purlins besides 7-inch channel purlins at eaves and ridge. The end and center panels between roof trusses and the end panels in all four walls are X-braced with 1-inch round diagonal rods; the side wall framing consists of horizontal and vertical channels, and there are horizontal channels and three intermediate columns in the end walls. Over the court there is a double-pitched 50 by 90-foot copper skylight, and the remainder of the roof surface is shingled, as are the walls. The shingles are laid on tar paper covering $\frac{7}{8}$-inch matched wall boarding, nailed to 6-inch wooden studs covered on the inside with $\frac{1}{2}$-inch insulation. The window sills are 9 feet above the grade of the court, and the steel sash are horizontally pivoted and are operated by vertical rods and gears. Radiators are set on the walls just above the tops of the foundation walls, 3 feet above the floor.

Considerable study has been given to securing the



Top Ch	2 L 5 x 4 x 3/8
Bot. Ch	2 L 5 x 3½ x 3/8
1-H	2 L 3 x 3 x 3/16
1-2	2 L 3 x 2½ x ¼
2-3	2 L 3 x 2½ x ¼
3-4	2 L 2½ x 2 x ¼
4-5	2 L 3 x 2½ x ¼
5-6	2 L 2½ x 2 x ¼
6-7	2 L 3 x 2 x ¼
7-8	2 L 3 x 2½ x ¼
8-9	2 L 2½ x 2 x ¼
9-10	2 L 3 x 3 x ¼
10	2 L 4 x 4 x 5/16

TRUSS DIAGRAM

END VIEW OF STEEL FRAME

Photos. Albert Rothschild

STEEL FRAME FOR INDOOR TENNIS COURT OF HENRY ROGERS WINTHROP, JR., ESQ.

DELANO & ALDRICH, ARCHITECTS

View of Framework

most attractive and satisfactory type of framing and roof construction for the main court buildings, and efforts have been made to adapt important features of greenhouse and hangar construction that apparently meet some of the conditions demanded in tennis courts, but they vary so greatly in dimensions that they afford little direct precedent. It has proved difficult to modify the greenhouse types and details for the much larger dimensions of the courts, while the hangar trusses have been found much too deep, and to occupy too much space for the courts. Strength, minimum obstruction to light and interior space and a light, graceful effect are desiderata that were secured to a large degree in the design for Mr. Williams' court at Bayville, N. Y. The 72 by 130-foot court building, 50 feet high, has a 230-ton structural steel framework with eight main transverse Gothic arch bents of plate girder construction. The hingeless arch ribs are 3 feet deep at the base where they have horizontal flanges anchor-bolted to concrete piers. Each semi-arch rib is shop-riveted in two sections, tapered to a depth of about 20 inches at the crown, where and at the haunches, there are field riveted splices. The springing line is 8½ feet above the base, and up to this level the ends of the ribs are vertical with parallel flanges, made as are the curved portions with four 6 by 6-inch X-flange angles and ½-inch web plates. The end panels between arch ribs are X-braced with 1-inch round

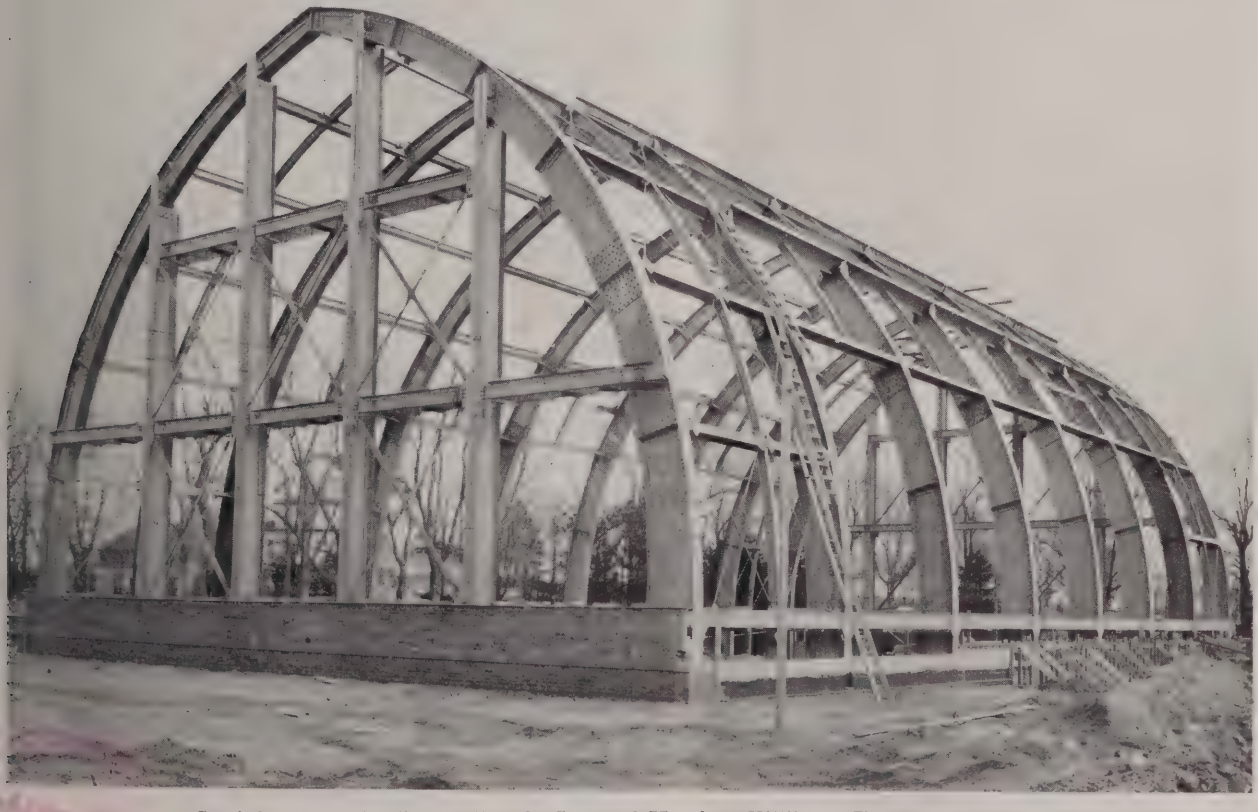
Steel Frame of Indoor Tennis Court on the Estate of Marshall Field, Esq., Huntington, N. Y.

Warren & Wetmore, Architects; Office of John Russell Pope, Consulting Architects

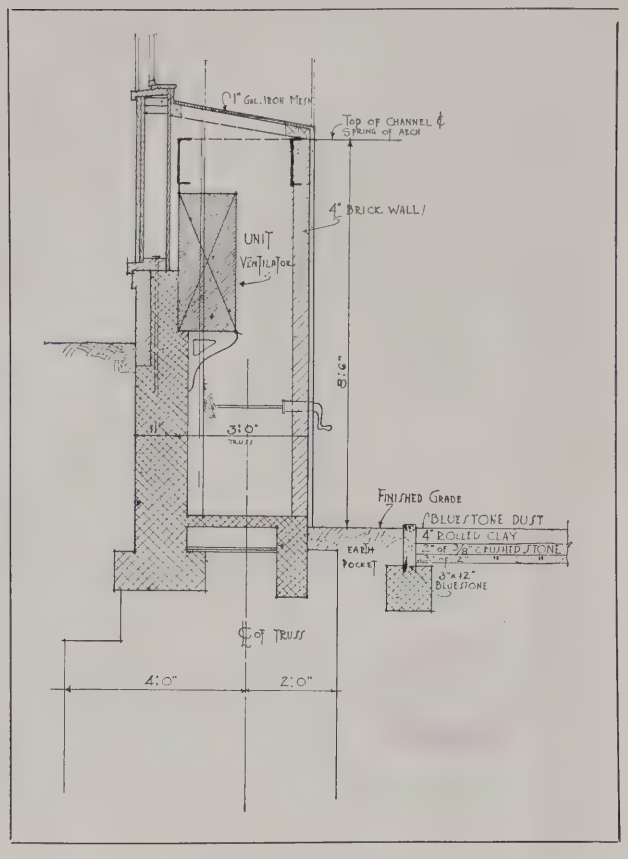
diagonal rods. Each end wall has four intermediate columns with I-shape cross sections, and is X-braced with 3½ by 3½-inch angles in the three center panels. In each side wall there is a double line of horizontal longitudinal channels at the spring line, and above them are 11 lines of longitudinal I-beam purlins, flush with the outer flanges of the arch ribs, provided with nailing strips to receive the 3-inch splined, dressed planks that are slated to form the roof and side walls.

In the center of the roof there is a copper skylight, about 52 feet wide; a wooden lattice with 2½-inch diamond mesh is set about midway between the inner and outer flanges of the arch ribs, concealing the purlins and reducing the apparent exposed depth of the ribs, giving them a slender appearance. The lattice and steelwork are painted in contrasting colors. The thoroughly rolled clay floor has a broken stone foundation and a bluestone dust finish and is enclosed by a bluestone curb. In two of the north side wall bays there are 14 by 14-foot windows with horizontally pivoted steel sash operated by miter gears and rods. Artificial illumination is provided by about 50,000 kw. of 200-watt white lamps and reflectors set in a continuous trough at eaves level, beside which additional lamps light the roof spaces, all controlled by a solenoid switch by which they can all be simultaneously turned on or off. Modulated steam heating units, each with an independent electric blower, are installed along the walls under the

End View of Framework



Steel Structure for Indoor Tennis Court of Harrison Williams, Esq., Bayville, N. Y.
Delano & Aldrich, Architects

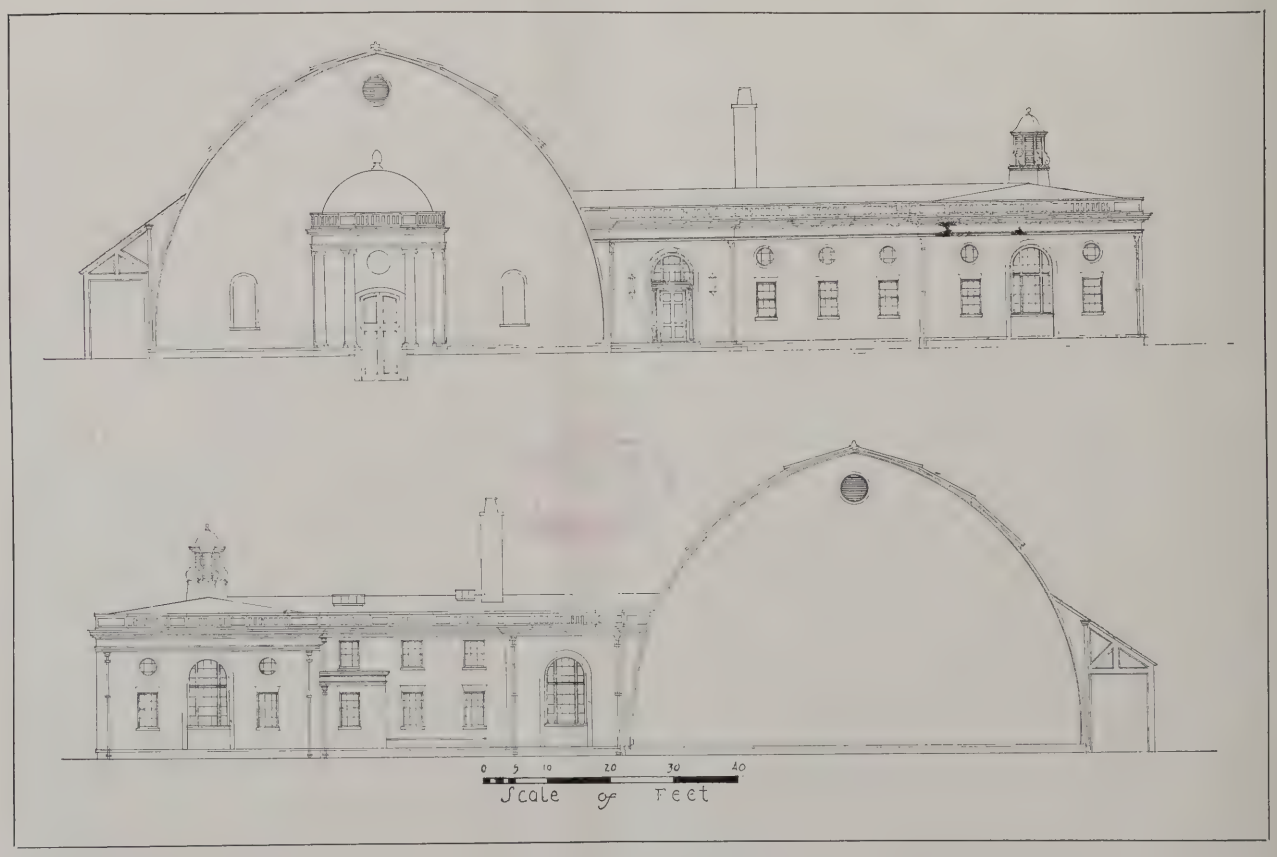


Section Showing Details

high window sills, and are enclosed by an inside brick curtain wall. Between the roof planking and the interior lattice work there is a layer of waterproof paper and another layer of chemically treated hair felt. On the north side of the court there is a 90 by 85-foot two-story extension containing lounge, kitchen, dressing rooms, baths and a 20 by 49-foot tiled salt water swimming pool with complete pumping, heating and filtering apparatus.

The steel frameworks for both the Winthrop and Williams tennis courts were erected in about two weeks each by a foreman and five men, using a guyed steel derrick with 65-foot boom and pneumatic riveting hammers operated by air from a portable gasolene compressor. Since the erection of these buildings, the company that fabricated and erected the steelwork has nearly completed the erection of another tennis court, very similar to the Williams court, for Mrs. H. P. Davison, and in the latter work has handled the structural steel with the 50-foot, 5-ton boom of a crane truck.

The most recent advance in indoor tennis court construction is explained by Gavin Hadden, C. E., in *American Lawn Tennis*, May 20, 1928. In his design the trusses arch the court longitudinally, giving a maximum headroom, at the net line, and come down to anchorages well back of the base lines; a most logical arrangement. The arc of the truss is similar to the arc of the tennis ball's flight.



East and West Elevations

Tennis Court of Harrison Williams, Esq., Bayville, N. Y.

Delano & Aldrich, Architects

HEATING AND VENTILATING FOR ARCHITECTS
ARTICLE IV

BY
PERRY WEST
CONSULTING ENGINEER

IT is not the details of the different kinds of heating and ventilating systems and apparatus with which the architect is primarily concerned. Rather it is with the broader principles and the general scheme of a system which will best fit the particular project which he has in hand. For this reason it is generally better if the architect's genius is employed on a visualization of the general scheme rather than on the making of a plan around some particular kind of system or apparatus. Most experienced architects realize that there is a general weakness toward preconceived ideas that certain kinds of systems and apparatus are necessary, and that these are the important factors in success; for example,—that a certain kind of boiler, pump, fan or heater, or that a vapor system, a vacuum system, a fan system or a split system is the all-important factor. It should be remembered that there are many different kinds of systems and apparatus which may be used with equal success, provided the design and installation of the equipment are proper, and provided also that their care and operation are commensurate with the service which they are intended to render. There are many features and not a few details of every mechanical equipment in which the architect is vitally interested, and it is with these features and details that we shall deal here rather than with those in which the designing engineer is particularly interested. There are certain items of mechanical equipment,—such as kitchen equipment, laundry equipment, hospital equipment and refrigeration which are not, strictly speaking, heating and ventilating items, but which are usually handled with the heating and ventilating equipment. The general features of these will be included.

The personal factors must be taken into full consideration in connection with each installation. The first of these are the owner's preferences and connections, as well as his ideas of the character and quality of the service. The owner must be educated away from as many of his superficial and impractical ideas as possible. Another personal factor enters into the operation and care of the equipment. There should be a definite planning for this by either installing such simple apparatus as may be properly taken care of by the most incompetent attendants likely to be employed, or by arranging for more competent attention to more complicated equipment, either by the owner's employes or through some outside organization. This is perhaps the most important item of the personal problem, as there are more failures of mechanical equipment due to improper care and operation than from any other one cause. Especially is this true of the equipment in schools, hospitals and public or semi-public buildings if they are not under carefully supervised operating departments. All of these primary problems should be solved at the inception of the project. The requirements as to space for apparatus, chimneys, ducts, flues, pipe spaces, etc., should be worked out during the sketching stages and not after the plans are so far advanced that necessary and possible changes cannot be made. This is most important. Lack of proper space and arrangement are responsible for more failures than any other one cause outside of improper care and operation.

Turning now to the different kinds of building projects and the particular features of their equipment with which the architect is vitally concerned, we shall endeavor to cover these briefly. For the more general discussion of the different kinds of heating and ventilating systems, together with their advantages and disadvantages, relative costs and space requirements, the reader may refer to the author's articles in the April and June, 1928 issues of THE ARCHITECTURAL FORUM.

Residence Heating Apparatus. Because of the small size of the average residence operation and the general practice of not employing special expert advice on the heating, a great many of these plants are an annoyance to their owners. There is generally at least one defect in every otherwise satisfactory system, such as an improper chimney, inefficient radiation in one or more of the important rooms, improper air elimination, improper sizes or grading of pipes, too small a boiler or improper location and connection of the apparatus, which necessitates continual attention and the carrying of excessive pressures to overcome the difficulties. It is unfortunate that these conditions exist in so many of our houses where such avoidable annoyances should be eliminated, and where they may be avoided, by giving proper study and thought to the planning. It is impossible to lay down rules here for the complete elimination of these difficulties, but the architect should see that the points now to be taken up are properly taken care of by some one who is competent. The chimney should be of the proper height and size, should be so located as to be as near as possible to a proper location for the boiler and so as not to be interfered with by back drafts from air disturbances caused by adjacent roofs or buildings.

Boilers and Furnaces. The boiler or furnace should be of ample capacity but not so large as to operate inefficiently on the average winter loads. It should be located as near to the center of the load as possible, and be convenient for coal and ash handling. When feasible it should be near the exposed

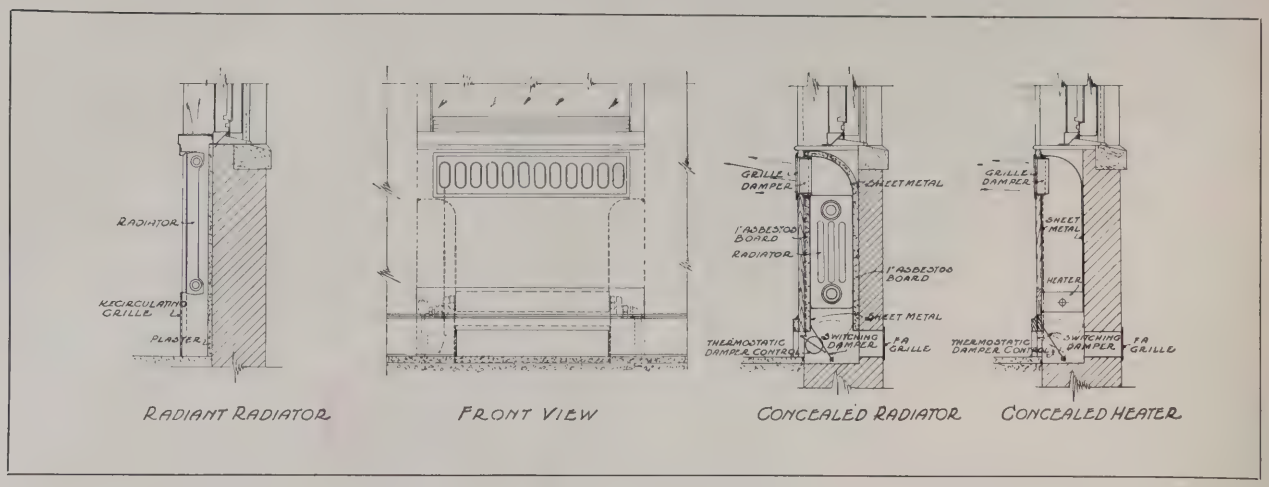


Fig. 1. Sections of Radiant Radiator, Concealed Radiator, and Concealed Heater

sides rather than the warmer sides of the building, and near the breakfast room, dining room, bathroom, living room or any other rooms requiring heat early in the morning or continuously rather than near bedrooms and other such rooms wherein the requirements are less exacting. Boilers for gas or oil should be specially designed for these fuels, as the ordinary coal-fired type of boiler will seldom prove efficient with fluid fuels. The piping should be balanced so that there will not be long runs to some parts of the building and short runs to other parts, since the long runs will require more pressure and longer time for circulation, as compared with the shorter runs. When long runs are unavoidable, separate lines should be used. One way of reducing uneven lengths of runs, in any steam or hot water system, is to run the supply and return mains parallel and with the flow in the same direction, so that the first radiator fed from the boiler is connected to the end of the return farthest from the boiler. This makes the combined length of the supply and return for each radiator practically equal.

Air Elimination. Proper air elimination is one of the most important requirements of any steam system. Securing the best automatic air valves or other automatic air eliminating apparatus is a good investment. Poor elimination of air is not only an annoyance in the matter of the time required for the heat to return to the radiators whenever the pressure is reduced and is again being raised, but is costly in the amount of fuel required to raise the extra pressure for driving the air out through the small apertures of usual air valves. The steam could be recirculated at much less pressure and with much less expenditure of fuel, but for the requirements of air elimination. The extra fuel for this may amount to as much as 20 per cent of the total fuel used, depending upon the regularity of operation.

The two-pipe open or vapor systems eliminate air most freely and are generally equipped with automatic devices for preventing the return of the air except through the slow leakage which is unavoidable in any system (through the joints and pores of the materials). Such systems operate over long periods, frequently at pressures below atmosphere, thus keeping the radiators filled with vapor as long as any appreciable heat remains in the boiler. The pressure must be raised, however, above atmosphere for certain periods, in order to eliminate such air as may leak into the system. One- and two-pipe closed steam systems must have air valves on the radiators and at the ends of basement mains. These valves should be of the best quality and may be of the non-return type for preventing the return of air to the system when once it is removed, somewhat as was just described. Although most of these non-return valves require slightly more pressure to operate than do the ordinary air valves, they are in operation for so much shorter periods that they are a convenient and economical adjunct to most systems. Open or vapor systems may be operated so that the condensation is always returned to the boiler by gravity, or they may be equipped with automatic apparatus for periodically returning the condensate by means of the steam pressure from the boiler. With the former arrangement, pressures above a few ounces are not permissible, as the water would be raised above the air outlet and either be discharged or close the outlet. With the latter arrangement, any pressure may be carried, and it is recommended for use in all except the smaller installations.

Radiators and Grilles. Radiators or warm air registers are recommended to be placed under or near windows, although there is some advantage in placing warm air registers on the inside walls so that the flues for them may be run in inside partitions, and be kept away from the cooling effect of the outside walls and from obstructing the window openings. The locating of the sources of heat under the window causes a mingling of the rising current of warm air with the falling current of cold air at this point. This offsets the chilling effect of the most severe exposure and at the same time produces the best diffusion of air in the room. The modern tendency is toward use of heating units designed to keep the

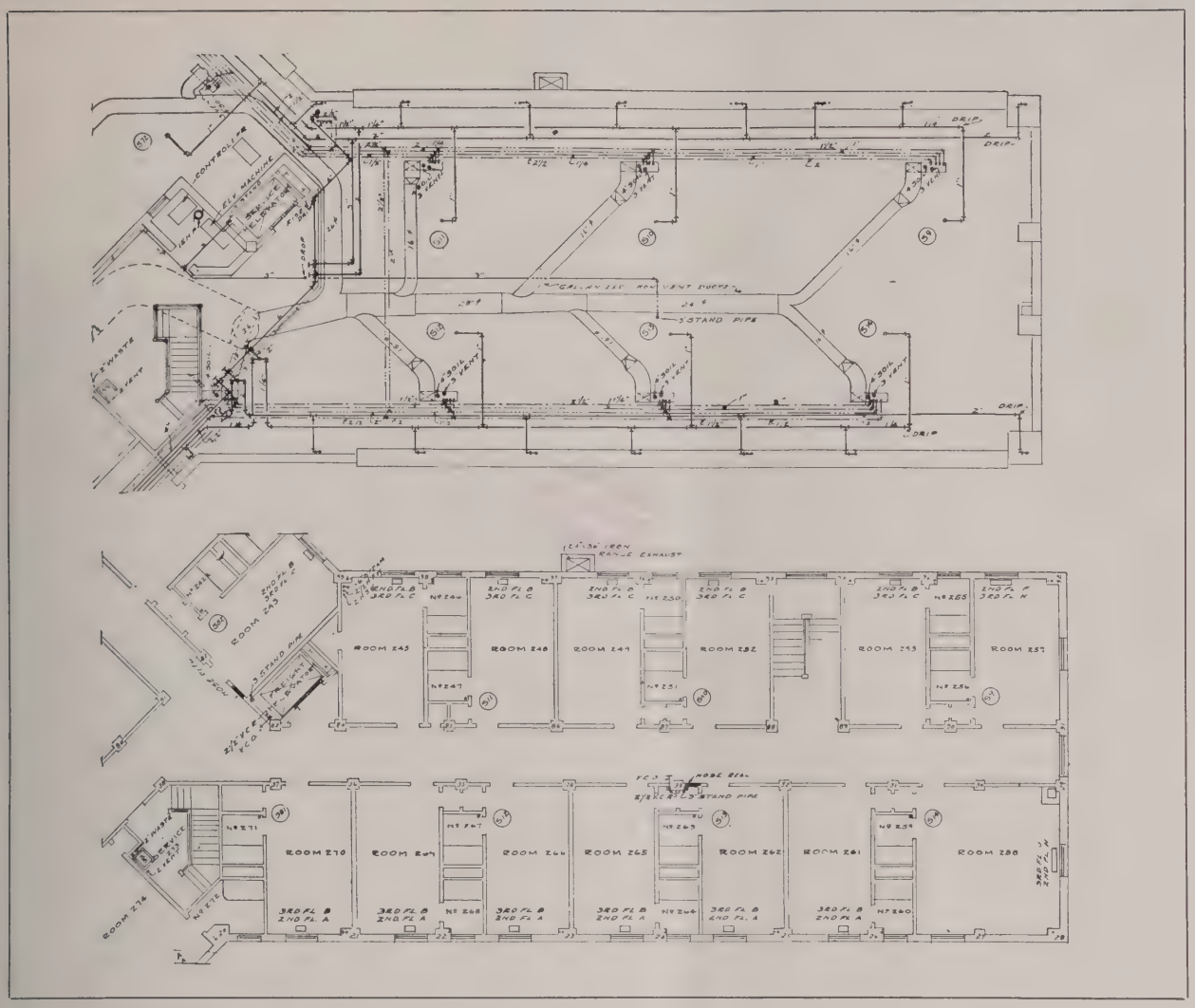


Fig. 2. Heating and Ventilating Layout for a Southern Hotel

heat from rising to the ceilings, thereby tending to equalize the temperature between floor and ceiling. This prevents unnecessary waste of heat by cutting down the losses through ceilings and upper parts of walls and makes for more comfort for the occupants, with less expenditure of fuel. Radiators designed for this purpose give off more of their heat by *radiation* and less by *convection* than do ordinary radiators. The concealed or cabinet type of heater may be used for the same purpose. These accomplish this by drawing the cold strata of air from the floor and replacing this air with warm air through a grille above, thus confining the circulation to a zone more or less between the floor and the height of the grille. Ordinary radiators may be used in the same way by installing them in scientifically designed cabinets or recesses with proper casings, grilles and dampers.

Fig. 1 shows a radiant type of radiator, a concealed heater and a concealed radiator arranged as was just described. Any of these may be used with or without fresh air connections from the outside. It should be noted that the control of the heat is by dampers controlling the volume of air passing over the radiator, and that no control valves are necessary on the steam or water connection. Valves may be included for use in case of repair or for long shutdowns if desired. The air control dampers may be automatically operated by self-contained thermostats located in the return air to each heater; this constitutes a splendid control system without pipes or auxiliary machinery. The fresh air connection may be from the outside or from a duct system supplied by a fan. In the latter case, air filters and humidifying apparatus may be used. In any case a switch damper is provided for varying the proportions of fresh and recirculated air. In case the fresh air is supplied from a fan, it assists the recirculation by an ejector action.

Residence Ventilating Apparatus. Ordinarily speaking, residences do not require much artificial ventilation. An exhaust fan for the kitchen, one for the laundry, and one for each toilet room are good adjuncts to any well appointed establishment. Ventilation may be provided for living rooms, dining rooms, reception rooms, ball rooms, etc. by means of the concealed heaters referred to or by a warm air fur-

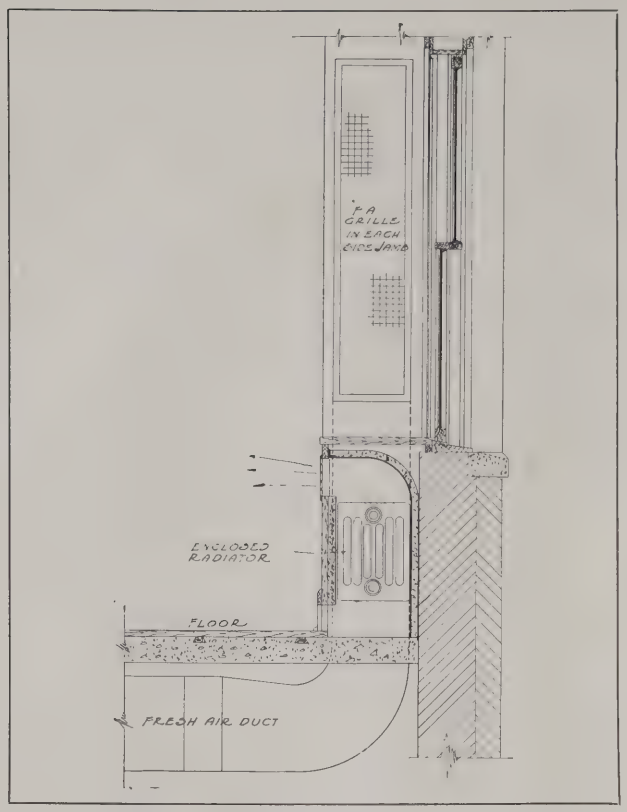


Fig. 3. Typical Method of Providing Fresh Air for Dining Rooms, Ball Rooms, Etc.

nace system of heating and ventilating. Furnaces are now being marketed with fan circulation which makes them very positive and economical in operation. In any furnace installation, recirculation ducts should be provided from the main stair hall and the principal first floor rooms to the fresh air intake of the furnace, and louvered openings should be installed in the walls or doors of second floor rooms leading into the main hall so as to prevent the wind pressure against any particular room from retarding the flow of heated air to these rooms. Such a recirculation arrangement is very economical for heating up or for regular use in extremely cold weather.

Hotel Heating Apparatus. The heating of hotels is generally by steam and sometimes by hot water. The boiler horse power requirements for modern hotels in our northern cities are about these:

For bedroom for heating and ventilating	0.75 to 1.00
For 1000 cubic feet for heating and ventilating	0.2
For bedroom for heating water	0.25
For bedroom for refrigeration	0.10
For kitchen for a 100-room hotel about	15.00
For a 1000-room hotel (kitchen) about	30.00
For laundry for a 100-room hotel about	20.00
For a 1000-room hotel (laundry) about	50.00

This represents an average of about 1.3 boiler horse power per bedroom for all purposes.

The maximum electrical requirement for the average hotel is about 0.5 kw. per room for all purposes. If this is generated on the premises it will require about 1.9 boiler horse power per bedroom. Assuming that 80 per cent of this is available as exhaust for use for heating and hot water, it will be seen that it about balances the average heating and hot water load, figuring 40 per cent of the maximum as the average heating load. There are certain variations in load factors, however, and while the lighting and hot water loads decrease only slightly during the summer months, the heating load disappears, so that there is a preponderance of exhaust steam to be wasted from April to November in the colder climates and for a much longer period in the warmer climates. Generally speaking, a private generating plant for furnishing the electric current for light and power and exhaust steam for heating and hot water becomes a financial success where current from the outside costs 2 cents or more per kw. hour and may range from this up to 5 cents per kw. hour for the warmer climates. Nothing is included in these figures for management and general business overhead for the operating of such an added department. If such a department entails added expense to an organization not already equipped to manage it, the rates given here should be increased.

There are two points which should be borne in mind, however. One is that the refrigeration may be steam-driven and furnish just about sufficient exhaust steam to generate the hot water. This is not apparent at first, since the maximum hot water demand represents from two to three times the boiler horse power required to drive refrigeration machines, but the total daily consumptions are about equal. The only requirement necessary to take advantage of this is large hot water storage, averaging about 25 gallons per bedroom. Under this arrangement the hot water and refrigeration may be produced for about 20 per cent more than the cost of either when produced separately. The other point is that when a complete generating plant with reserve units is not a paying investment, a single steam-driven turbine unit for use as a pressure-reducing valve on the heating system and to generate the bulk of the electric current with auxiliary and break down cross connection with the public service electric company's lines for taking care of the variations in load during the heating season and the entire electric load during the non-heating season, constitutes a most economical arrangement for almost any hotel or other similar building. For further data as to the boiler and machinery plants of hotels, the reader is referred to the author's article in the April issue of The Architectural Forum.

The radiation in the principal rooms should be preferably of the concealed or built-in heater type. Radiators in bedrooms and elsewhere should be preferably of the legless type, hung on walls and

connected to pipes run out of the walls so as to keep all radiators and connections free of the floors.

A vacuum system of heating or a forced circulation hot water system is preferable in a hotel on account of quick response and the positive circulation to all parts of the building at all times. Bathrooms, toilet rooms and public rooms may be piped on separate circuits with centrally located control valves on each of these and on the system supplying the bedrooms, so that any one or more of these sections may be cut off when not required. This is especially important in warmer climates where a little heat is required in toilet rooms and public spaces morning and night when not required elsewhere. Fig. 2 illustrates a steam system for a southern hotel employing separate systems for bathrooms and for bedrooms. Sometimes heating equipment is omitted from interior bathrooms, and in some such cases the radiator for the adjacent bedroom is placed near the bath so as to serve both. While an interior bath (without exposure) requires little heat, it must be warmer than the bedroom should be so early in the morning before the bedroom is heated, after being ventilated and cooled by open windows during the night. To try to heat both rooms with one radiator not only requires more surface and more fuel, but it also defeats the requirements mentioned. Fig. 4 shows a good arrangement of bedrooms with interior bathroom heating.

Hotel Ventilating Apparatus. It is of the first importance that the kitchen of a hotel be ventilated. Next in order of their importance as to ventilation are the toilets, dining rooms, ball rooms, assembly rooms, public rooms, lobbies, barber shops, laundries, store rooms, and machinery rooms. Bedrooms are rarely supplied with artificial ventilation except indirectly through exhaust from adjoining bathrooms. Corridors of the bedroom floors, especially the lower floor corridors of tall hotels in warm climates, are sometimes equipped with exhaust ventilation. Kitchens usually occupy from 50 to 80 per cent of the floor space required for dining rooms. Dining rooms are proportioned on from 8 to 12 square feet of floor space per person served. Kitchens must have exhaust ventilation of from 20 to 40 air changes per hour. Most of this may be exhausted through the hoods of ranges, dishwashers and urns, but in larger kitchens there should be exhaust outlets distributed around the rooms, especially in alcoves, under galleries, around ranges, steam tables, etc. Toilet rooms should have from 20 to 60 air changes per hour; interior baths 10 to 15; dining rooms 6 to 12; bathrooms 6 to 10; assemblies 10 to 15; lobbies 4 to 6; store rooms 1 to 2, and machinery rooms 6 to 12. The intensity of ventilation is to be varied with the character and requirements of the operation and the type and character of apparatus used. With good air conditioning apparatus and a well designed distribution system, the intensity of ventilation may be reduced to or below the minimum figures given here. Double mechanical systems require less air than either the single-supply or the exhaust system.

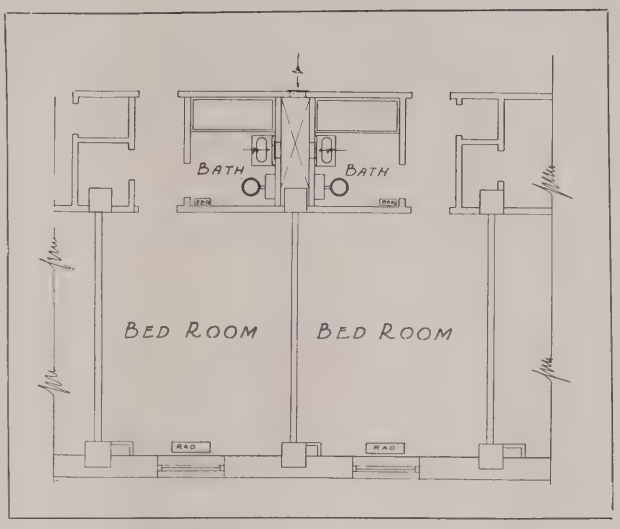


Fig. 4. Exhaust System for Interior Baths

Duct Sizes. As a rough guide for the sizes of main ducts, the velocity in supply ducts leaving the fan may range from 900 to 1200 feet per minute, but should be gradually and progressively reduced, in accordance with accepted practice, throughout the duct system leading from the fan. Main exhaust ducts may have velocities ranging from 800 to 1000 at the fan inlet with gradual and progressive reductions throughout the systems. A rough guide to the space occupied by single-width fans may be had on the assumption that the outside length is twice the width, and the capacity in thousands of cubic feet of air per minute equals the product of the length by the width in feet. The height is about 1⅓ times the length. Double-width fans of the same diameter have twice the capacity. This gives ample space, which may be slightly reduced when the apparatus is actually laid out. Fig 2 illustrates a typical layout of exhaust ventilation for both interior and exterior bathrooms. Fig. 5 shows a typical hotel ball room with exhaust ventilation. The fresh air may be taken in through concealed radiators or heaters as shown in Fig. 1, or from a fan supply system through a system such as shown in Fig. 3. Large portions of the kitchen air supply may be taken from the dining room if adjacent to, above, or below the kitchen, thereby assisting in ventilating the dining room and tending to carry the cooking odors and noise toward the kitchen and away from the dining room. The air supply for all portions of a hotel should be filtered and washed, and automatic humidifying apparatus should be provided. In some of the better installations, air cooling and dehumidifying apparatus may be used in dining rooms and assembly rooms. This subject was also discussed generally in THE ARCHITECTURAL FORUM for April, but there are several specific points which may well be covered here.

Department Store Heating Apparatus. Department store heating is a comparatively easy matter as far as the heating system itself is concerned. It is usually vacuum steam or forced hot water and

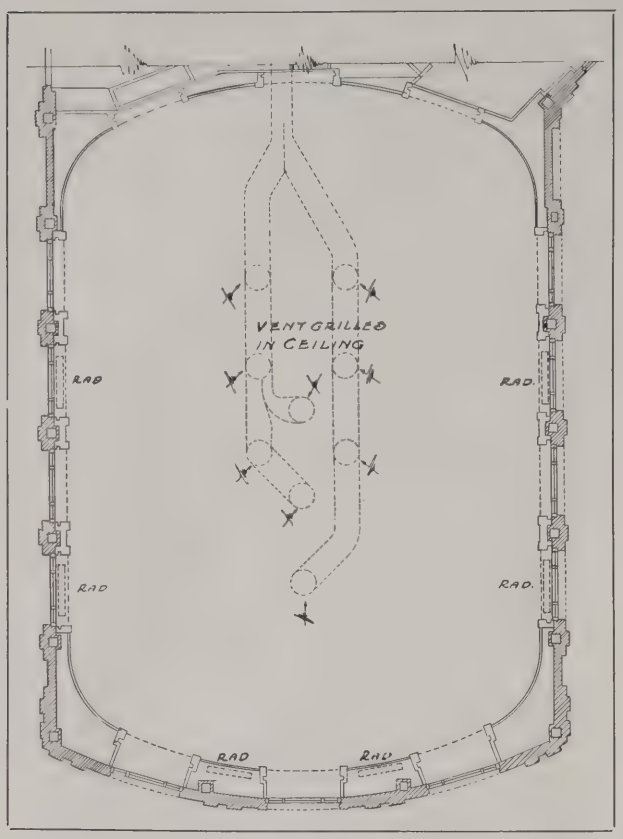


Fig. 5. Typical Ball Room Exhaust System

should be under automatic control for the main sales floors if not for the entire building. The first floor and bargain basements of the modern city store are so congested, have so little exposure, and there is so much heat given off by lights, machinery and people that the problem is one of cooling rather than heating most of the time. The first or street floor does require special attention for the heating around entrances. If this is not properly taken care of, the entire first floor may be drafty and disagreeable. These conditions are usually met by a proper combination of the heating and ventilating systems. A private generating plant is not so likely to be a paying proposition in a store as in a hotel, as the heating requirements are less in proportion to the available exhaust steam. Where much refrigeration is required for fur storage or for air cooling, an absorption refrigerating system, using this surplus exhaust steam, may be employed to reëstablish this balance. A plant may become a paying investment under such conditions. High pressure steam is generally required for cooking and for sterilizing, etc., so that the entire boiler plant is usually operated at around 100 pounds pressure.

Department Store Ventilating Apparatus. The street floor and all sales basements should have the best kind of supply and exhaust ventilation. The fresh air supply should be at least filtered, washed and tempered under automatic control, and the washers should be arranged for humidifying and humidity control. The fresh air should be brought in high around the walls, especially over show windows, and the exhaust should be taken out through grilles in the floor cases, well distributed over the entire floor area. Two or more floors may be ventilated together with the same volume of air where conditions are favorable. The street floor, where ceilings are high and the crowding less than in the basement, may be supplied with fresh air which in turn is exhausted through the floor for ventilating the first basement. Air cooling is frequently used for the main sales floors, especially for bargain basements, and sometimes for dining rooms and assembly rooms. A complete system affording dehumidifying cooling and reheating for summer, and heating and humidifying for winter, all under automatic control, should be employed. The partial cooling of air without enough refrigerating capacity to reduce its moisture content and without reheaters to raise the temperature to within 6 to 8 degrees Fahr. of the outside temperature will result in a chilly, humid, disagreeable atmosphere. A good store ventilating system, employing filtered and washed air but without air cooling and dehumidifying, costs about $50 per 1000 cubic feet of space ventilated. A system for air cooling and dehumidifying will cost about 50 per cent more.

To overcome the drafts and cooling effects caused by cold air being drawn in through the street entrances, two precautions are usually taken. One of these is to supply more air to this floor than is exhausted through the ventilating system so as to allow the excess to pass through the elevator shafts and stairs which would otherwise draw this air in through the entrances. The other is to supply large volumes of reheated air to the vestibules, thus providing a warm greeting to patrons and at the same time insuring that the air which leaks in is warm. Dining rooms, kitchens, assembly rooms, waiting rooms, toilet, store rooms, machinery rooms, etc., should be ventilated as for hotels.

Commercial Buildings. Stores, restaurants and assemblies may use the same kind of apparatus as specified for hotels and department stores. The cost of apparatus for this class of building ranges from 5 to 10 per cent of the cost of the building. The heating and ventilating apparatus for the commercial type is discussed in the author's article in The Architectural Forum for June.

Industrial Buildings. These may be very successfully heated by forced circulation hot water or by vacuum steam. Unit heaters are used very extensively and are very efficacious, especially in rooms with tall ceilings. The use of units tends to keep the heat down in the working zone and at the same time saves floor and wall space, piping, etc. Central fan systems are used to accomplish the same purpose and usually work out best where particular air conditioning is necessary. For relative costs of different kinds of heating and ventilating systems for industrial buildings see *The American Society of Heating and Ventilating Engineers' Journal* for January, 1928.

SANITARY DESIGN IN MODERN BUILDINGS

BY

HAROLD L. ALT

SANITATION has grown in recent years to be an important consideration,—especially in buildings of considerable size. There are probably two reasons why the architect must consider sanitation and plumbing,—first, plumbing installation is more or less dogmatic and is largely controlled by local plumbing codes with which the architect must comply; second, the plumbing pipes, which are of sufficient size, require special concealment, so that an architect must take into account the locations of these pipes in connection with the structural and architectural features of the building. In its humble way, plumbing quietly provides a "service" in a building that is essential to health and comfort. Every architect realizes that it is necessary to have a sufficient number of toilet rooms scattered through a building to adequately serve the occupants, and he must consider the desirability of having outside windows in such rooms, the desirability of artificial ventilation, and the absolute necessity of providing mechanical ventilation in toilet rooms without windows.

Number of Plumbing Fixtures. It is not desirable to install fixtures which may never be required, but it is even worse to have a shortage of fixtures. In buildings where the number of occupants per floor or per section of a floor can be approximated with reasonable accuracy, the number of plumbing fixtures should be proportioned to the number of occupants. In an office building the space is not rented nor are the partitions located at the time the structure is designed, and consequently the number of plumbing fixtures must be proportioned to the area.

PLUMBING FIXTURES PER 100 PUPILS FOR AMERICAN SCHOOLS

Fixture	Max.	Min.	Average (per 100 pupils)
Waterclosets	7.29	2.95	4.92
Urinals	2.19	1.47	1.79
Lavatories	10.22 (a)	1.82	4.90
Drinking Fountains	4.66	0.52	1.68
Slop Sinks	1.11	0.26	0.68

(a) Excessive.

The variations in the figures, which are based on actual schools, are due somewhat to the increased facilities provided for the younger children in the grammar schools. An average of five high schools and three grammar schools ranging from 500 to 2,000 pupils shows this interesting tabulation in the ratio of fixtures to each 100 occupants:

Fixtures:	Waterclosets		Urinals		Lavatories	
Class of Building	Max.	Min.	Max.	Min.	Max.	Min.
High Schools	5.33	2.95	2.19	1.47	10.22	(a) 2.26
Grammar Schools	7.29	6.03	2.18	1.57	6.43	1.82

(a) Excessive.

These same buildings have also been worked out on a cubage basis, the buildings ranging from 500,000 cubic feet to 4,500,000 cubic feet. Maximum and minimum ratios for the high schools and grammar schools show these figures per 100,000 cubic feet:

Fixtures:	Waterclosets		Urinals		Lavatories	
	Max.	Min.	Max.	Min.	Max.	Min.
High Schools	3.31	2.09	1.54	0.73	4.09	2.11
Grammar Schools	7.00	4.36	2.40	1.03	4.27	2.00

NUMBER OF OCCUPANTS PER FIXTURE FOR MEN

	Waterclosets		Urinals		Lavatories	
	Aver.	Max.	Aver.	Max.	Aver.	Max.
Auditoriums	150	250	300	400	150	300
Banks	16	20	25	35	15	25
Churches	150	200	300	400	150	300
Clubs	50	100	200	300	100	150
Department Stores	100	200	250	300	100	200
Factories	25	30	50	60	20	30
Hotels			(See Note A.)			
Hospitals			(See Note B.)			
Libraries	150	200	300	400	150	300
Office Buildings			(See Note C.)			
Public Buildings			(See Note D.)			
Schools			(See Note C.)			
Theaters	150	250	300	400	150	300
Y.M.C.A.			(See Note E.)			

NUMBER OF OCCUPANTS PER FIXTURE FOR WOMEN

	Waterclosets		Lavatories	
	Aver.	Max.	Aver.	Max.
Auditoriums	100	150	150	300
Banks	10	15	15	25
Churches	100	150	150	300
Department Stores	75	125	100	200
Factories	15	20	20	30
Hotels		(See Note A.)		
Hospitals		(See Note B.)		
Libraries	100	150	150	200
Office Buildings		(See Note C.)		
Public Buildings		(See Note D.)		
Schools		(See Note C.)		
Theaters	100	150	150	300
Y.W.C.A.		(See Note E.)		

Note A—Modern hotels usually install an individual bathroom for each bedroom, the bathrooms being supplied with one watercloset, one lavatory and one bath or one shower or a combination of both.

Note B—Hospital fixtures are so varied in type and so special for the services required that no standards of quantity can be quoted.

Note C.—Given in detail elsewhere in this article.

Note D—Varies depending upon use of building and accommodation desired.

Note E—Varies in different parts of the building according to the uses at different floors.

A few office building ratios are also given for what they may be worth, although it should not be forgotten that these four buildings are all in service and that the plumbing fixtures have proved adequate.

SQUARE FEET OF FLOOR AREA PER FIXTURE

Building	Men's W.C. Sq. ft.	Women's W.C. Sq. ft.	Urinals Sq. ft.
Office Building No. 1	5143	7200	7200
Office Building No. 2	2050	4100	4100
Office Building No. 3	5038	7316	7316
Bank & Office Building	3435	6870	3435

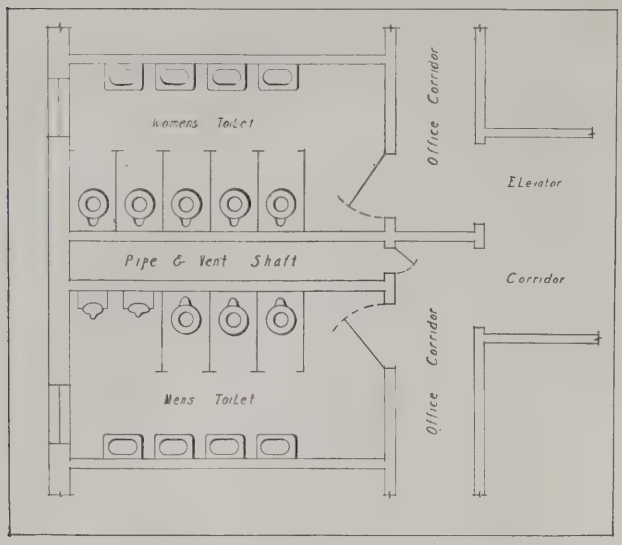


Fig. 1. Arrangement of Fixtures in an Office Building

Arrangement of Fixtures. In arranging toilet rooms it is usually desirable to place the urinals next to the windows, then the waterclosets, and the lavatories close to the toilet room doors. Where a room is wide enough, the lavatories may be located on the opposite wall near the windows, as in the arrangement shown in Fig. 1. Consideration should also be given to toilet room locations so as to serve all portions of each floor without too great a travel distance. In large buildings the cheapest arrangement, as far as installation cost is concerned, is to place the toilet rooms for each sex adjacent to each other so as to use the same risers and vent shafts. Care must be taken, however, to keep the doors as far apart as possible, and, preferably out of sight of each other. A typical layout is indicated in Fig. 1. Where the travel distance from the farthest office door to the toilet room door exceeds 200 feet, the toilet room becomes an inconvenience rather than a convenience, and it is far better to place two groups of smaller toilet rooms on each floor than it is to use only one larger group and thus double the travel distance. Moreover, with two groups of toilets, one may be used in case of difficulty with the other. For very small office buildings, an economical arrangement is to locate the toilet rooms off the stair landings midway between floors, and to alternate the rooms,—between the first and second floors would be, say, a young women's toilet; between the second and third floors, a women's toilet; between the third and fourth floors, a men's toilet, etc., to the top of the building. With this arrangement access to a toilet for either sex is obtained from each floor by either going down or up half a flight of stairs.

Toilet rooms are so much governed by local conditions in the building that it is hard to give anything in the nature of a standard arrangement. If it is remembered to put the fixtures most requiring ventilation next to the outside windows, to screen the entrances from passing observers, to keep the entrances for toilets accommodating opposite sexes out of sight of one another, and not to make the travel distances too great, the chief toilet room demands will have been met. It is also a good thing to introduce a slop closet and slop sink so as to use

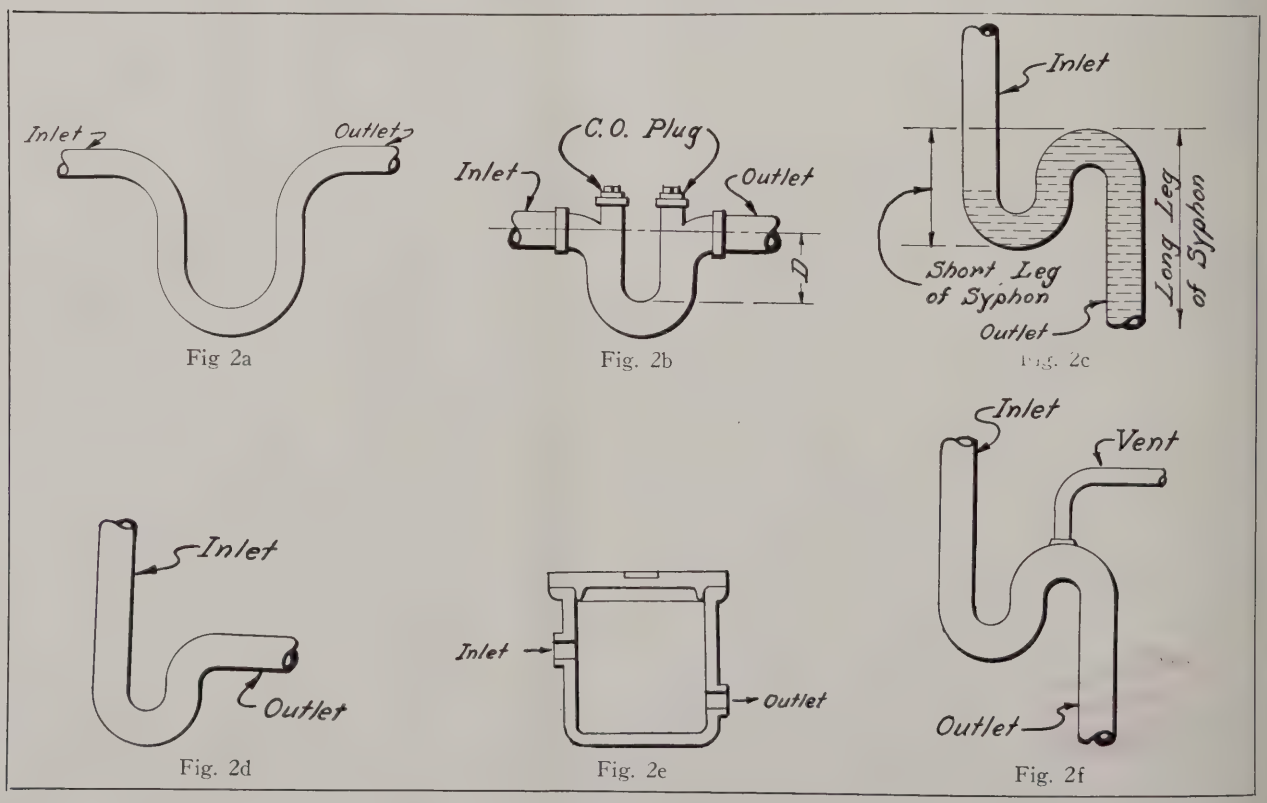


Fig 2a Fig. 2b Fig. 2c

Fig. 2d Fig. 2e Fig. 2f

Fig. 2. Various Types of Plumbing Traps: 2a and 2b, Running Traps; 2c, "S" Trap; 2d "P" Trap; 2e, Pot Trap; 2f, Crown Vented "S" Trap.

the same piping as the toilet rooms where possible, as this makes separate plumbing risers for slop sinks unnecessary. Floor drains are not usually installed in toilet rooms, owing to the fact of insufficient water being used to keep the traps filled; they are still used in some cases, but it is questionable if they are necessary, and they certainly are undesirable. Drinking fountains are usually limited to corridors, where the surrounding walls and floors should be well protected against splashing.

Plumbing Traps. The basic idea underlying all plumbing design as far as the soil, waste and vent systems are concerned, is that all sewer gas generated either in the street sewers or house drainage pipes must be prevented from entering the rooms. As far as the pipe system itself is concerned, sound pipes and gas-tight joints are necessary. The openings which must be made in the piping system for the drainage outlets of fixtures cause the real difficulty. The most satisfactory solution yet found is to water-seal such outlets by means of what is commonly termed a trap. In its simplest form this is nothing more complicated than a bend in the waste or soil pipe made so that water is trapped and retained, thus preventing the flow of gas or air. The first passage of water through a trap leaves a sufficient quantity of water to form a seal against gas or air, as shown in Fig. 2b, where the depth of the water seal is indicated by "D."

There are many kinds, styles and designs of traps, so many that a whole article could be devoted to their illustration and description and still leave the subject far from complete. Most traps, however, fall into four or five general classes which may be listed as "S" traps, "P" traps, pot traps and various special traps, shown in Fig. 2. Some traps are integral parts of the plumbing fixtures,—such as water-closet traps, slop sink trap standards, etc.; other fixtures, as lavatories, baths, sinks, etc., must have the traps supplied in the waste piping. A favorite provision in many plumbing specifications is, "Each and every fixture must be properly trapped." While the water-seal does prevent the free flow of gas into the room, the seal may be "broken" by the loss of the water. In many instances syphonic action is set up by a heavy flow of water through the trap, or even by a heavy flow from some nearby fixture, which, in passing rapidly down the waste line, leaves a partial vacuum in its wake, or builds up a pressure in front of it. The syphonic action is illustrated in Fig. 2c and when the water is drawn out of the trap of a fixture by the discharge of the fixture itself, the action is termed, "self-syphonage," whereas, if the water is drawn out by the discharge of an adjacent fixture or fixtures, the trap is simply "syphoned."

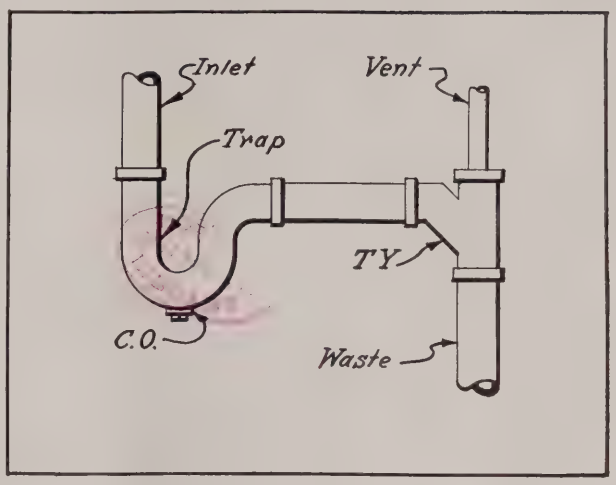


Fig 3. Good Venting Practice

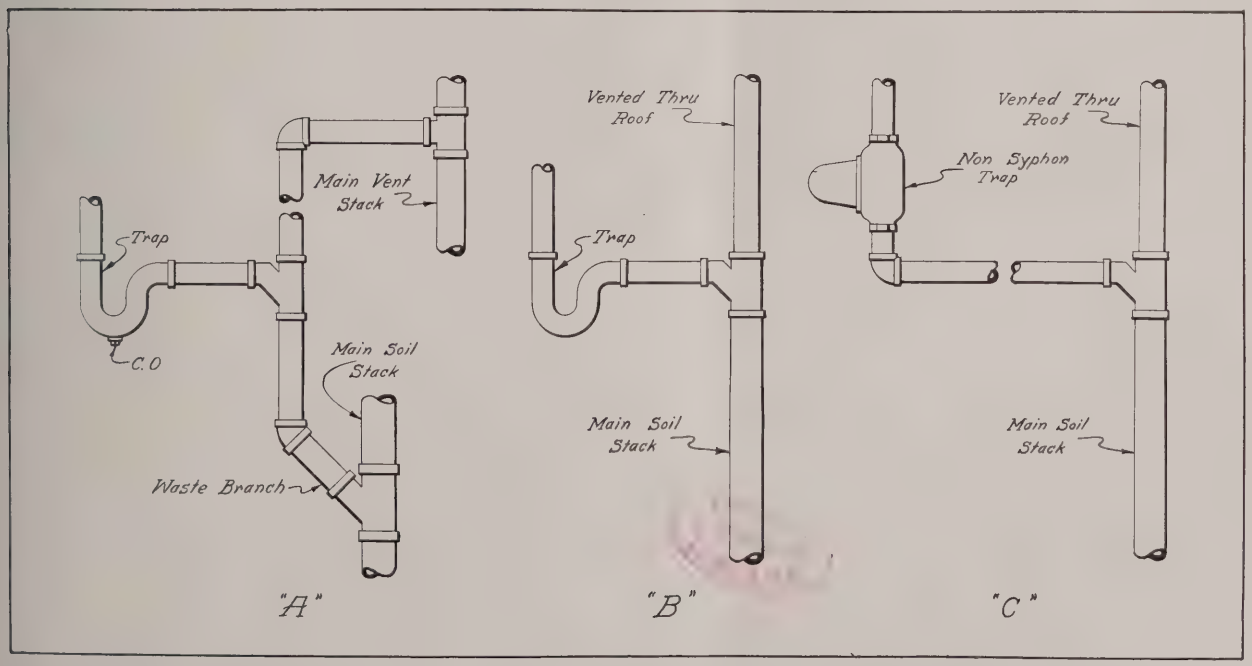
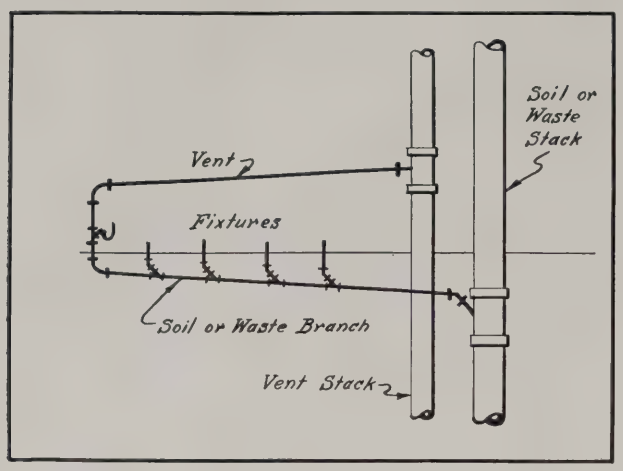
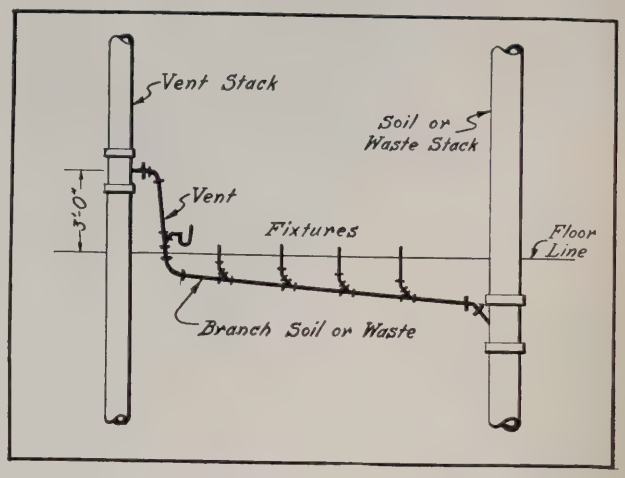


Fig. 4. Modern Venting Practice; "A," Continuous Vent for Lavatory; "B," Circuit Vent for Lavatory; "C," Circuit Vent for Fixture at Distance from Soil Stack.





Figs. 5 and 6. Two Arrangements of "Loop" Venting

There are three ways of preventing syphonage and self-syphonage. One is to make the trap so deep that the water-seal cannot be syphoned out by any ordinary contingency; this is hardly practical owing to the increased danger of stoppage occurring in such deep traps. The second method is to make a large reservoir in the trap so formed, that although the trap may be partially syphoned, there will still be enough water retained in the chamber to reseal the trap. The third method is most commonly employed and is known as "venting" or "back venting."

Venting. The fundamental idea of the vent is the principle that a syphon can be broken by a very small hole admitting air to the top of the syphon. In venting plumbing traps the "very small hole" is made a fairly good sized hole to make it more difficult to clog up by splashings, scale, rust, etc. Theoretically, such a vent should be attached to the high point of the trap, as illustrated in Fig. 2f, and vents were so connected for many years. The vent so located was very quickly blocked by particles thrown up into it by centrifugal action of the water as it flowed around the bend. While there is considerable confusion in the terms applied to vents and venting in different parts of the country, a vent connected to the high point or crown of the trap is generally termed a "back" vent or "crown" vent. To overcome the clogging of the vent opening a method of piping was devised which is usually termed a "continuous" vent. With this type of vent a "P" trap is necessary, and instead of venting at the high point, the outlet is carried horizontally a short distance (usually not to exceed 18 inches) and is then connected into a drainage tee or TY, from the bottom of which the waste is taken and to the top of which the vent is connected as shown in Fig. 3. This method of venting is regarded today as being the surest way, and is the method required in New York.

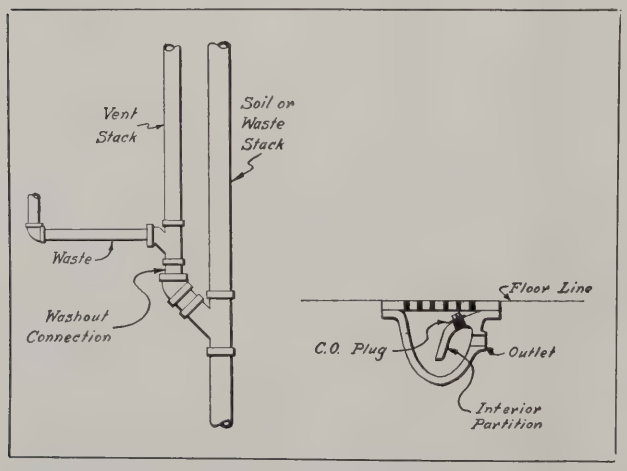


Fig. 7. *Left:* Washout Connection at Base of Vent Stack. *Right:* Partition Trap, to be Avoided.

Waterclosets, stall urinals, baths and bottom outlet slop sinks do not lend themselves to continuous venting. Fixtures which permit the use of a true continuous vent are the sink, lavatory, wall hung or lip urinal, back outlet slop sink, and laundry tray. With waterclosets a vent is usually taken off the vertical side of the lead bend immediately below the fixture. Bottom outlet slop sinks are similarly treated; stall urinals and bath traps have tees on the waste lines immediately beyond the traps to which the vent connections are made. Another method of venting is known as "circuit" or "loop" venting. In many ways this method of venting seems just the opposite of that just described. With "circuit" or "loop" venting there is no individual vent connection to the soil or waste from the fixture; instead, the main soil or waste line itself is vented and the fixture traps are kept as close as possible to the vented line. This is the method used in Philadelphia and many other places, although various minor modifications are incorporated in the requirements of the different cities. In some localities the rule is to have regular traps on fixtures and to keep the traps within certain specified distances of the vented line; in others, traps are allowed at greater distances from the vented line but are required to be of the non-syphon type; in still others, all wastes up to certain lengths can be carried into a vented stack singly and without vents, but if two wastes are united at any point, then that point must be vented. In theory,

circuit or loop venting makes the main vented soil or waste line or the main vent itself perform the function of a continuous vent. The way in which this is done is indicated in Fig. 4, where "A" is a continuous vent for a lavatory, "B" a circuit vent for the same fixture, and "C" shows the usual method employed in circuit venting when the fixture is farther away from the vented line. The term "loop" vent has been developed from applying circuit venting to batteries of fixtures, the end of the waste pipe being "looped" back to the soil or waste pipe, or,—if there are other fixtures above on the same stack,—to a separate vent stack as shown in Fig. 5. Sometimes to save piping the main vent stack is placed at the opposite end of the battery from the soil or waste stack and the end of the horizontal drainage is connected into the vent 3 feet above the floor. Fig. 6.

Every vent stack should have a washout connection made at the bottom by emptying the waste from some fixture (usually not a water closet) into the base of the vent stack in the manner shown in Fig. 7. The idea back of this is to wash out dust, dirt and scale which otherwise might settle at the bottom of the stack and in time cause trouble. House traps and fresh air inlets in general seem to be included with continuous venting and are often omitted with circuit venting; this rule, however, has many exceptions. The original idea back of the requirement calling for a house trap is to exclude from the building the sewer gas originating in the street sewers and to allow a current of fresh outside air from the fresh air inlet to circulate through the house lines. If the house trap is omitted, then the air circulating through the house piping is from the street sewer and is more than likely to be sewer gas. Consequently, if a trap in the building should be syphoned in spite of the venting precautions taken,—or a cleanout should be opened up temporarily for cleanout purposes,—it is likely that the air coming from the drainage system would not be as objectionable with a house trap and fresh air inlet installed as it would with the house drain connected to the street sewer with an untrapped run of pipe. All good plumbing codes prohibit the use of traps depending for their waterseal on an interior partition of the trap. An example of this type of trap, which should be avoided, is shown in Fig. 7, where the cleanout screw is particularly objectionable owing to the ease with which an opening can be made through the partition by the removal of this screw.

Floor drains are seldom if ever vented, for three good reasons; in the first place a floor drain usually has a deep seal trap and a comparatively large quantity of water retained in the trap, so that its syphonage is difficult; in the second place it is not subject to sudden and concentrated discharges of water; and, third, it is likely to have long periods of disuse, when there is a tendency for the water to evaporate, leaving the trap dry. This evaporation would be hastened by connecting a vent near the trap and subjecting the water to a circulation of air over its surface.

Roof leaders should always be carried down to the basement separately and should be trapped before entering the drainage system. If leader traps are not installed, sewer gas is likely to find its way up through the leaders and out of the leader boxes on the roof; these leader boxes in some instances may be located close to windows or other points where sewer gas would be objectionable. Area drains, in climates where the outside temperatures go below freezing, should consist of boxes with dirt pockets in the bottoms, and the piping from these boxes should be carried inside of the buildings, trapped, and then connected to the nearest drainage lines. Trouble may develop unless these traps are placed inside of the buildings where they are protected from freezing. No venting is desirable on area drain traps or roof leader traps, because it is open to the objections as in the case of floor drains.

One of the first points to be determined in laying out the plumbing for a building is deciding on the size and elevation of the outside sewer. It is generally considered as good practice to have the invert of the building connection not lower than the top of the street sewer, and of course if it can be kept even higher it is better. The practical objection to coming in below the top of the street sewer is that when this sewer is running full the sewage will back into the house line and may cause a stoppage.

Sub-sewer Drainage. When fixtures or drains lie below the level of the street sewer, as often happens in basements and sub-basements, it is necessary to pump the sewage to a point high enough to permit it to flow to the street sewer by gravity. This is often done by a sewage ejector of the compressed air or centrifugal pump type. Where such ejectors are necessary, they are installed in conjunction with pits or receivers in which the sewage is collected and expelled from time to time by the entrance of compressed air or the action of the pump. Where dependable action is important, such ejectors are generally installed in duplicate, and the discharge pipe is carried out and is connected to the house drain beyond the house trap. A check valve is also placed in this line to prevent the sewage backing down into the ejector after each period of operation. Usually a fresh air inlet is required or a vent on the pit, and in some localities the vents on all lines emptying into the pit must be carried through the roof separately. In other places the vents may be connected into vent stacks used on the gravity lines, thus saving piping.

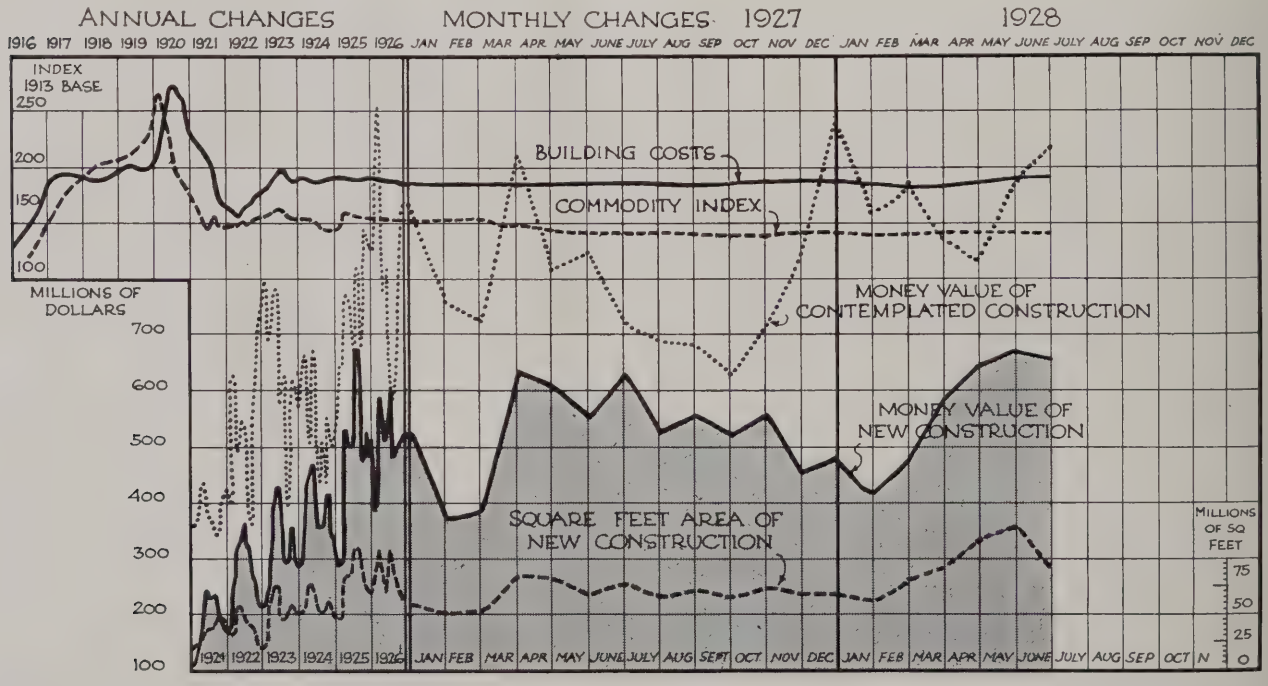
Roof Leaders. When these are not run on the outside of a building, they should be carried all the way to the basement entirely separate from all other piping and at the bottom should have running traps through which they are connected into the house drain. A house drain which carries combined soil and roof drainage is usually sized on the basis of roof water to be handled plus one pipe size for the soil. The carrying capacity of the house drain varies with the pitch, but it can be obtained from almost any handbook having a table on flow of water in sewers.

THE BUILDING SITUATION

THE RETURNS FOR JUNE ESTABLISH NEW RECORDS

THERE has been a rather phenomenal increase in building construction during the first half of 1928, which has been quite contrary to the general predictions made at the beginning of the year, when indications led most experts to anticipate activity approximately equal to that of 1927, or possibly slightly lower. Not only do the figures recorded by the F. W. Dodge Corporation show new records being established for June and for the first six months, but they show an unusually large volume of contemplated new work in several important sections of the country. June construction in the 37 eastern states, representing about 91 per cent of the entire United States, amounted to $650,466,200. This is the second highest monthly total on record, being 3 per cent ahead of the June, 1927 record and only about 2½ per cent under the total for the preceding month of this year. A glance at the chart upon this page shows graphically the comparison of activity between this month and half-year and similar periods since 1920. Contemplated new work reported in June amounted to the exceptional total of $1,030,095,000, which is 17 per cent in excess of the May, 1928 total and 41 per cent ahead of the June, 1927 record.

There has been an interesting change in the type of contruction contituting these totals. The June contract record included 40 per cent of all construction for residential buildings, 20 per cent for public works and utilities, 14 per cent for commercial buildings, and 10 per cent for industrial projects. This represents a lessening predominance of residential construction and an increase in industrial work and public works utilities. The regional situation is particularly interesting. New York state and northern New Jersey established a new record for June in new building contracts, and an increase of 9 per cent for the first six months over the total for the first half of last year. Contemplated construction shows an increase of 77 per cent over the total for June, 1927. In the New England States new construction showed a 15 per cent increase over the total for June last year, but a drop of 32 per cent from the amount reported in May, 1928. The first six months' construction totals 21 per cent higher than the corresponding period of last year, while contemplated new work is more than double the amount reported for last June. In the Middle Atlantic States a new June contract record was established. While the six months' total represents an increase of 12 per cent over the corresponding period last year, contemplated projects dropped 19 per cent from the amount reported for the month of June, 1927.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

PAYMENT FOR ARCHITECTURAL SERVICES

DETERMINING AND COLLECTING FEES

BY
C. STANLEY TAYLOR

WITH the exception of a relatively few well established architectural offices whose prestige has brought them an extensive clientele of the highest quality and whose business enables them to decline commissions from prospective clients of doubtful credit rating, practically every architectural office experiences at some time or other serious difficulties over the problem of securing adequate architectural fees and of collecting the fees which have been charged and earned. It may be safely said that every architect has given this problem of fees and their collection a great deal of serious consideration. It is a subject worthy of more frequent discussion and exchange of ideas for the benefit of the profession. This is a two-fold problem,—what to charge, and how to get the fees charged. Each of these phases has various aspects worthy of consideration, among which several might be noted. In establishing architectural fees, the architect must determine the value of the services, the basis upon which he establishes his charges, and the variations in charges based upon different types of service rendered. The problem of getting the fees involves salesmanship, the rendering of service commensurate in value with the fees charged, the conducting of his work so that the client will have no hesitancy in paying the established charges after the agreement has been signed, and finally protection against losses through bad credit.

Professional service can rarely be measured by accurate, fixed standards. Doctors have long been accustomed to charging for their services in accordance with their patients' capacity to pay, rendering some services free and charging high fees for equivalent services to others. Lawyers have followed somewhat the same course, although in that profession the tendency is to charge in accordance with the importance of the case, because there is no obligation to accept work when called upon, as in the case of the medical profession. Architects, however, have established a custom of basing their fees on a percentage of the cost of the work carried out under their direction. While this is not a fixed practice for all types of work, it is largely prevalent, so that the general public has learned to measure the cost of architectural services in terms of a percentage of the cost of the work designed and carried out. There is, therefore, in the architectural profession, something in the nature of a fixed or standard charge, and a real problem revolves around deviations from this standard charge, made necessary either by unusual conditions arising on a specific problem, or by variations in the caliber of the services rendered, resulting from less or greater experience and knowledge, with a correspondingly less or greater value of the services to the client. From the client's point of view, architectural services are seldom rated at their true value, probably because clients rarely appreciate the amount of work involved and the skill and training required to carry on professional activities. They seldom realize that the average architectural office is something of an organization, with assistants "behind the scenes" to do a great deal of preparatory and detail work, which the client sees only in the form of drawings, specifications or occasional supervision of construction work.

In architectural problems in which economic considerations predominate over æsthetic matters, such as in the development of investment buildings, industrial structures, and the like, the typical client is fairly well able to measure the architect's capacity, because the measure is based on familiar terms, and is measurable in similar structures produced by the architect for others. Likewise, in important institutional work, such as hospitals and schools, and in some more or less technical design problems, such as theaters and the more complex hotels, there is public recognition of the need for special training and experience, and there is usually a willingness to pay without question adequate fees charged for such service. Where æsthetic considerations predominate, as in the development of better residences, the design of churches, public works and monumental structures of various types, the average prospective client is less capable of distinguishing between the value of the services of one architect and those of another, with the consequent result that where cost limitations sway the client's choice, there is a definite tendency to give undue consideration to the fees charged by various architects as against their real capacity to handle the proposed work. It is hardly necessary to say that consideration of the fees charged by various architects influences the selection of architects to a greater or less degree in the great majority of building problems.

The importance of the work accomplished by the American Institute of Architects in establishing minimum fees for various types of work is in no wise diminished by the fact that the very result which was sought has brought along with it other problems to the architectural office, where experience and capacity warrant higher charges than the minimum established. It is true that the minimum fee of 6 per cent for average work is frequently lowered, not only by architects who are not members of the Institute, but occasionally by those who are. This may be due to competition or because a proposed project involves much repetitious work, as in the case of a tall loft building, and the minimum charge is in such cases not only greater than the traffic will bear, but greater than the services are worth. "Cut-rate" architects introduce the most difficult problem in maintaining and getting adequate architectural

fees. They render a service much less complete and probably much less valuable than that rendered by an office which we may call, for lack of better words, a more ethical office. In the large cities this situation is most acute. A case in point personally known to the writer, concerned the designing of a Park Avenue coöperative apartment building in New York, costing approximately $600,000 to build. The promoters paid the architect $3,600 for drawings, including the four elevations, plans of the basement, ground floor, second floor, typical floors, and roof. Into these plans were condensed indications of all mechanical equipment, such as the location of plumbing fixtures, electrical outlets and radiators; but there were no specifications, structural drawings or details of mechanical equipment, and no full-sized details. Obviously, the architect did not render any supervisory service. The promoters turned over the entire project to their builders, and they purchased materials and such equipment as they saw fit and probably used stock designs of cut stonework, ornamental ironwork and other decorative elements as were approximately indicated on the architect's drawings. The normal fee for this project under the American Institute of Architects schedule would have been ten times the fee received by this designer. Actually, the architect designing this building was making a fairly substantial income out of such work, for he put into his plans little of the skill and experience required for a really competent handling of such a problem. In the face of such competition it is not strange that many members of the Institute, striving to maintain the standards to which they are pledged, wonder how they can get adequate work.

The primary purpose of this article is to invite a general discussion of the subject and to secure an interchange of ideas and experiences. A number of important considerations affecting architectural fees are outlined for this purpose, and some matters frequently overlooked when considering the problem are presented in detail. It is evident to many that the standard minimum fee of 6 per cent must be varied in accordance with the amount of work involved in the proposed commission. From various sources we have gained the impression that these factors customarily influence architects in establishing their charges for specific commissions.

1. *Size of the Work.* Few architectural offices can do small residential work on a 6 per cent basis, and the customary charge ranges from 8 to 10 per cent for buildings costing less than $15,000 to possibly $25,000. Some architectural offices are so organized that they cannot take any project costing less than from $50,000 to $100,000 for less than 10 per cent and make a reasonable profit on the work. Large projects, on the other hand, such as great office buildings, large industrial plants and other types of structures running into $1,000,000 or more, can profitably be handled in almost any architectural office for less than 6 per cent, and in some cases charges as low as 4 or 5 per cent may represent an adequate compensation for the services rendered.

2. *Repetitious Work.* Many commercial and industrial buildings and tall apartments, hotels and similar structures repeat typical plan units so many times that the actual design work and detailing are reduced all out of proportion to the cost of the construction. Here again, less than the minimum fee may represent adequate compensation.

3. *Alterations.* The Institute recognizes the extra time, labor and skill involved in handling alteration work by establishing a minimum charge of 10 per cent. This minimum charge is subject to the same variations as the minimum of 6 per cent for new construction, due to the size of the project, the amount of detailing involved, the number of repeated units, and other factors.

4. *Decorations and Special Designs.* The problems involved in interior decoration, and in the design or purchase of furniture and cabinet work, are often more time-consuming than on alteration work, and a still higher fee may be necessary. Interior decorators frequently charge 15 per cent or more or obtain this amount of compensation through their discounts, and architects cannot afford to handle the work on a lower basis than a decorator. Frequently this problem is solved by a *per diem* charge, independent of the cost of furnishings and decorations.

5. *Consultation and Testimony.* Architects are frequently called upon for consultation work only or for court testimony, and for such work no percentage fee is possible. Here the charges must be based,—like those of the lawyer,—on the importance of the case and the value to the client of the services.

6. *Building by the Sub-contract Method.* The Institute has established a 4 per cent extra charge for handling construction work direct with sub-contractors, and this charge is exclusive of the cost of a resident superintendent. Usually this charge is adequate for the extra services performed, but the responsibility involved deters many architects from undertaking such contracts, regardless of the compensation. Firms engaged in large projects and equipped to handle the routine office problems and field supervision involved in sub-contract construction may properly make a lower extra charge and still be adequately compensated.

7. *The Value of Services.* The final governing factor is the relative value of the services rendered, due to the exceptional experience, talents and prestige of individual offices. This is a most difficult matter to estimate, and the problem is usually solved by charging what the traffic will bear and cheerfully declining prospective commissions where the client is unwilling to concede that value is represented in the higher than normal charge. Thus, the first problem is to establish a sound and fair fee for each individual project, based on the nature of the work to be performed and the intangible matter of the value of the services to the client. In the opinion of many, it is much more ethical to vary fees in this manner than to adhere to standard rates, making some clients

pay greater profit to balance losses on some others.

The next problem is in maintaining the established fees in competition. Only a small percentage of the architects of the country do not at some time or other have to seek desirable work. They are faced with a definite trading problem. Shall they bargain for a commission by cutting fees, or not? This is probably the most critical matter that ever arises in the development of an architectural practice. Under these circumstances the office gets the reputation of being a cut-rate office or a reputation for knowing the value of its services and maintaining its standards against all comers. The latter, of course, ultimately is the only sound course, provided the fees charged are actually commensurate with the value of the services rendered. Rather than offer a reduction in charges to secure desirable work in friendly competition, the successful method in the long run is to confine selling activity to presenting evidence of the fairness and reasonableness of the fees charged, based upon experience, past work, client's recognition of meritorious services, and prestige. More particularly, the reasonableness of the fees charged may be demonstrated by the nature of the architect's organization, the degree of responsibility he assumes, the completeness of the drawings and specifications he prepares, and the adequacy of supervision rendered by the architect's office. These are the real selling points for architectural services, for these are the things in which offices vary and which really measure to the client what he receives for the amount he pays. Selling effort is still repugnant to many architects, but subconsciously or otherwise, every architect does a certain amount of selling and is to a certain degree a successful salesman.

This brings us logically to the problem of how to get architectural fees. Broadly, this implies how to get commissions, but we cannot devote much time here to a discussion of selling methods. Basically the most successful method of getting new commissions is to incorporate into each project that is done within the office, such meritorious work that it will automatically bring recognition of capacity and ability, and with it new commissions. The problem of getting fees has other aspects of equal importance; we shall concern ourselves here with getting fees after the contract has been established. This phase of the problem has two distinct aspects. They are difficulty in collecting fees due to misunderstandings or trouble in the conduct of the work, and those due to bad credit of the clients. The conduct of every architectural project from the development of a $10,000 house to the designing and construction of a $5,000,000 hotel involves such a maze of problems and so many conflicting considerations that it is rare indeed that the entire project goes through smoothly without misunderstandings or even grave conflicts with the client. We can dismiss from consideration here the difficulties and misunderstandings that may develop with contractors or within the architect's own office, except insofar as they influence the client's appreciation of the services rendered and his willingness to pay the entire fee agreed upon. Architects have been forced to the realization that a successful practice involves very rigid conducting of office practice on the most businesslike basis. Only through exercising extreme care to reach a complete agreement with the client upon every detail as each problem develops can the architect safely protect himself from controversies which may cause the client to feel that the architect has been lax in his service.

Beginning with the very first relations with the client, it is most vital that the agreement that is reached be completely understood by both parties and expressed in a written contract so clearly that the responsibility and obligations of both the architect and the client are mutually understood. This is not a plea for elaborate and lengthy legal documents, cleverly worded by lawyers for both parties to cover every possible contingency that may arise; on the other hand, it cannot be doubted that the skill with which the contract is drawn and the clearness with which each element is phrased are most vital to the elimination of unpleasant controversies.

Probably the most important group of misunderstandings arise over the approval of preliminary plans. Few clients realize that when the preliminary drawings have been revised and restudied until they meet his requirements, his approval commits him to additional charges and costs if changes are subsequently directed. This is a matter the architect can largely control in two ways. First, he can make certain that the final preliminary drawings incorporate every feature with which the client is concerned; in other words, that they are complete with the exception only of structural features. In this connection the architect can advantageously prepare such thumb-nail perspectives and sketches as may be required to enable the client to visualize the structure more conventionally presented in the drawings. The second step is to go through a complete check list of all items mentioned by the client in preliminary conferences, together with all items which must be incorporated in the final working drawings and specifications, making written notes as to the client's reaction to each point before proceeding further. This work should then be followed by a written statement to the client to the effect that the approval granted to the preliminary drawings and check list completes the first part of their contract, and that in accordance therewith subsequent changes directed by the client are subject to an extra charge. By accompanying this memorandum or letter with a bill for the preliminary drawings, the architect at once brings to a head two matters: first, he establishes the client's written approval of the work thus far performed; and secondly, he obtains compensation for his services, or else immediately brings up any evidence there may be that the client is dissatisfied with the work so far accomplished. Neglect to render a bill promptly when payments are due is unbusinesslike and may lead to difficulty later on.

The next important group of difficulties surrounds the opening of proposals for construction. This generally brings to a head the architect's control of building costs, and is of extreme importance whenever the client has indicated a definite limitation upon expenses and has required the architect either in writing or by direct implication to keep the cost within a predetermined maximum. In a previous article we have discussed methods of keeping costs within a fixed budget. If the architect has followed those methods throughout the preliminary stages of his work and has acquainted the client with the effect upon costs which his decisions in the preliminary work have made, most of the trouble usually encountered at this stage is eliminated. The remaining problem arises from the fact that no preliminary estimates are sufficiently accurate to assure in advance the size of the ultimate contract proposals, and frequently bids are received so far above anticipated figures that the client is imbued with doubt as to the effectiveness with which the architect has controlled costs. Frequently the first bids received are higher than need be, due to misinterpretation of specifications or drawings on the part of the bidders, which can be cleared up through a frank discussion of the estimates with the low bidders. When this recourse fails to bring the price within the client's requirements, the architect is forced at considerable expense to revise his drawings and specifications and secure new bids in order to satisfy the client that he has performed his part of the contract in the proper manner. These difficulties are largely eliminated by constantly acquainting the client with the cost aspects of his building project as they develop in the early stages, and by explaining the margin of error which necessarily exists in preliminary estimates and which can only be determined by these actual proposals. One of the most successful methods employed by several leading architectural offices is to obtain from several contractors, who are ultimately to be invited to present final proposals, preliminary estimates based upon the approved preliminary drawings. This enables the architect and the client to reach some approximate agreement as to changes that may be necessary before the preliminary drawings are carried into the working drawings. When this is done the architectural office must exercise exceeding care that the final drawings and specifications do not deviate in any respect from the preliminary drawings without written approval of the client and an understanding of the effect upon cost of the modifications.

The third group of difficulties arise during the contruction operation. Lack of adequate supervision,—or perhaps lack of appreciation on the part of the client of what constitutes the architect's supervisory responsibilities,—is a fertile cause of misunderstanding. Forty per cent of the total fee is usually charged for supervision. A considerable amount of work in this stage is done in the architect's office, checking shop drawings, selecting and approving materials, preparing full-sized details and checking contractors' requisitions for payment. This work is seldom visible to the client; he conceives of supervisory work as being confined largely if not wholly to the architect's presence on the site during all construction stages. Frequently the client is not at the building when the architect or his representative appears. He, therefore, measures the architect's attention to this problem by the number of times he finds him at the site. Two solutions are offered to this problem. The first is to explain to the client in the early stages or to incorporate a clear statement in the contract as to the actual services which are to be rendered; another effective system is to have the superintendent submit a brief written report to the client following each visit to the work, indicating the conditions found and the general progress being made with respect to the anticipated completion date. If this is not done, at least such a statement should accompany each bill rendered for services during that particular construction period.

The other problem of collecting fees is due to the credit of the client. Promotional projects are the usual source of difficulty in collecting the fees that have been established. It is no reflection on the architect if he insists in all cases upon some evidence of the client's capacity to pay for the work he has ordered, and particularly is this important when the client is not well known to the architect or of such prominence that his credit standing can be readily checked through the usual mercantile sources. Many times have architects failed to give a thought to this problem in their anxiety to obtain commissions for interesting or imposing construction projects. The architect has only himself to blame if he does not ascertain the credit standing of his clients before undertaking a commission. Subsequently, however, much difficulty can be avoided if bills are rendered promptly in accordance with contract agreement as each stage of the work is completed. When the bills are not promptly paid, the architect should follow up the matter without delay, and if necessary decline to proceed with work until the matter is adjusted.

To summarize, then, the problem of architectural fees and how to get them resolves itself into a matter of good business judgment and good business conduct. Charges should be established upon a sound basis which represents adequate compensation to the architect for his skill and time, and adequate value to the client as a result of the work performed. Getting architectural fees is first a matter of intelligent salesmanship, not of "horn tooting"; and secondly, of conducting each stage of the work that credit problems are eliminated at the start and that a complete agreement is maintained between the architect and his client on every problem that arises which involves the client's decision. A final matter is to keep the client well acquainted throughout the project with the work actually being done by the architect, so that no doubt may arise as to the adequacy of the service for which the client is paying.

THE AMERICAN PUBLIC BUILDING

THE POPULAR MISCONCEPTION OF ITS PURPOSE, AND ITS CONSEQUENT LACK OF USEFULNESS

BY
ARTHUR T. NORTH

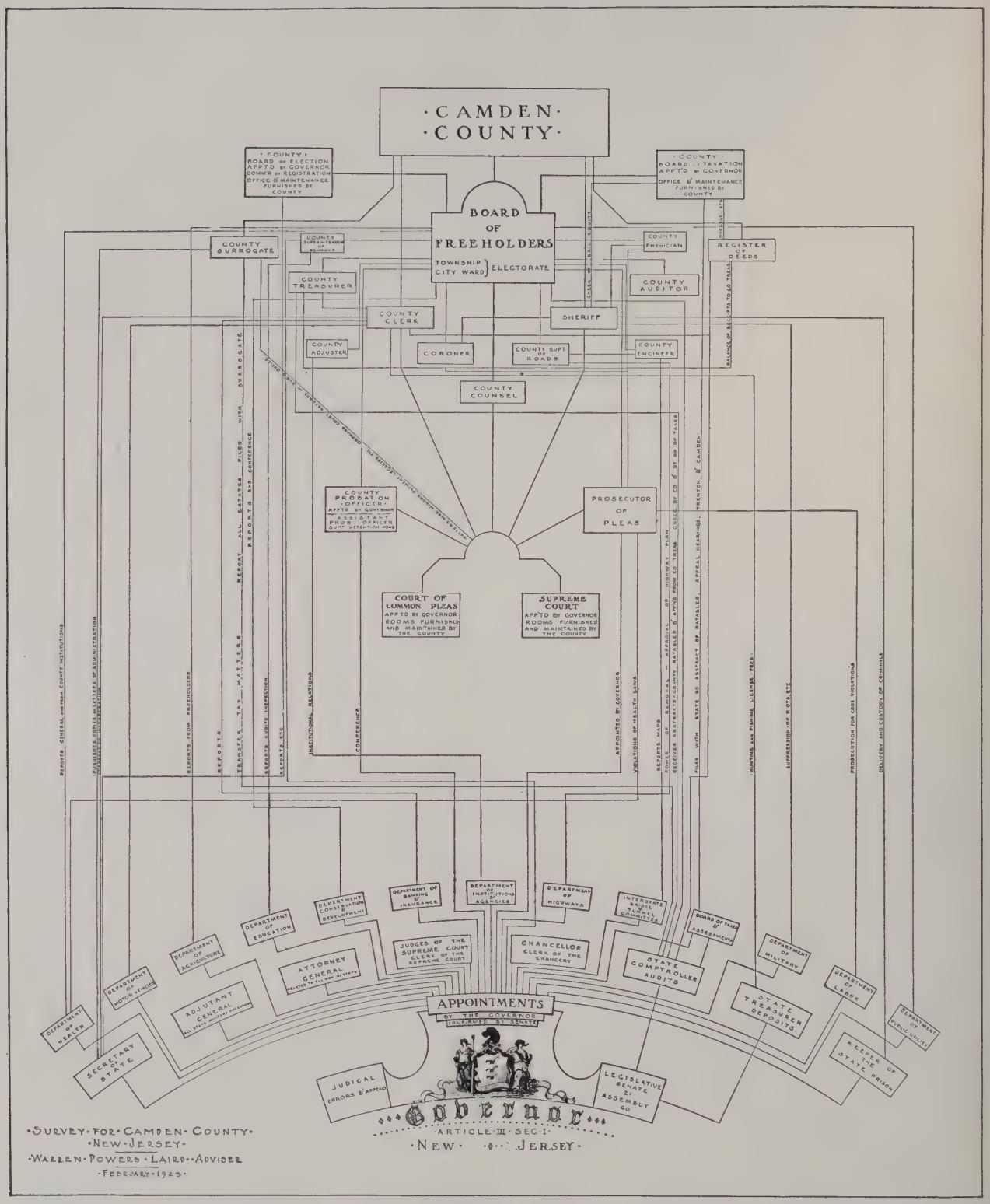
IT is a frequently made and generally accepted statement that "the past half-century has witnessed greater architectural development than the entire previous history of the world." This is true, because, preceding the past half-century, many of the essential materials of modern construction did not even exist.

Commerce and industry jointly constitute the mainspring of this architectural development, actuated directly by necessity and accumulated wealth. The three principal elements of the new architecture are the plan for essential utility, the structure for strength and durability, and the enclosure for protection. There is an indissoluble economic tie between the useful building and commerce and industry. As the latter expanded, the useful building came into being, perhaps very largely through the contributory and creative efforts of the structural engineer, the heating and sanitary engineer, the electrical engineer, and the transportation engineer who has devised our elevators, escalators and conveyors of every kind. Along with this development of commercial and industrial building, equal development has taken place in the dwelling, the theater, the schoolhouse and other buildings. All of these types have responded almost immediately to the changes in our style of domestic life, amusements and of education.

One type of modern structure, however, can usually be classed as a failure,—the public building, more particularly the public structure used for governmental purposes. The American public building,—state house, court house or city hall,—is often a failure because it lacks the essential element of utility. Several reasons contribute to this failure,—some of ancient origin and some of this day. In old times the governmental building might have been the palace of the king and his fortress, the archiepiscopal palace in some countries, the feudal castle, or the cathedral. In each of these were housed authority and wealth,—the people were largely slaves, economic, political and religious. These buildings,—the palace, fortress, cathedral, or castle, were of such sizes that they always dominated the surrounding country and adjacent buildings, and the more wealthy and powerful the government the more imposing was its housing. The building, then, became the visible, unchanging symbol or manifestation of government.

This conception of government buildings was

Perspective Showing Relation of Old and New Court Houses, Camden County, N. J.
Edwards & Green, Architects; L. F. Pilcher, Consulting Architect



Graphic Analysis of State and County Functions, based on Constitution and Statutes

brought to America, and quite naturally, because political freedom was not in existence at that time. When America did become free it was, perhaps, an exhibition of egotism and, maybe, a manifestation of an inferiority complex that inspired the pretentious public building. After becoming free from foreign domination, we built our capitol at Washington with its great dome and imposing approaches. Was this merely because of tradition, or was it a defiance to the rest of the world? The form of the capitol at Washington was followed by those of most of the states, and we now possess a collection of domed state houses that are unequaled for ugliness and inefficiency. It is a subject for useless speculation, it is true, as to what our public buildings would be had the capitol been designed for

utility first and dignity second. It is apparent that, as we descend in the scale of governmental importance and wealth to the county and municipality, the public building becomes progressively worse. Reproduction always deteriorates from the model; it is inevitable, and, strange to say, no apparent effort was ever made, except in perhaps few instances, to employ an adequate style for public buildings.

Architectural competitions for public buildings are largely a political expedient. Elected officials aim to avoid any appearance of discrimination between architects which might reflect on their professional ability, and the competition is held to maintain a position of apparent fairness. Architects are the only professional men who have to compete for commissions. It is unheard of to require lawyers, physicians, surgeons, engineers and other professional men to compete by submitting samples of their wares. The custom of holding unregulated competitions was attended with evils that precluded the participation of many of the more competent architects.

Some leaders of the profession, recognizing the barriers to satisfactory results of competitions, entered into a campaign to improve conditions which resulted in the adoption by the American Institute of Architects of rules for conducting competitions. Competitions conducted according to Institute rules with *experienced professional advisers* are productive of very satisfactory results. In some competitions it is customary for the competitors to select by ballot the architect member of the jury of award, thus insuring competent architectural judgment. Generally effective precautions are taken to preserve the anonymity of the competitors. Competitions today, however, too often are disappointing, and these should receive condemnation.

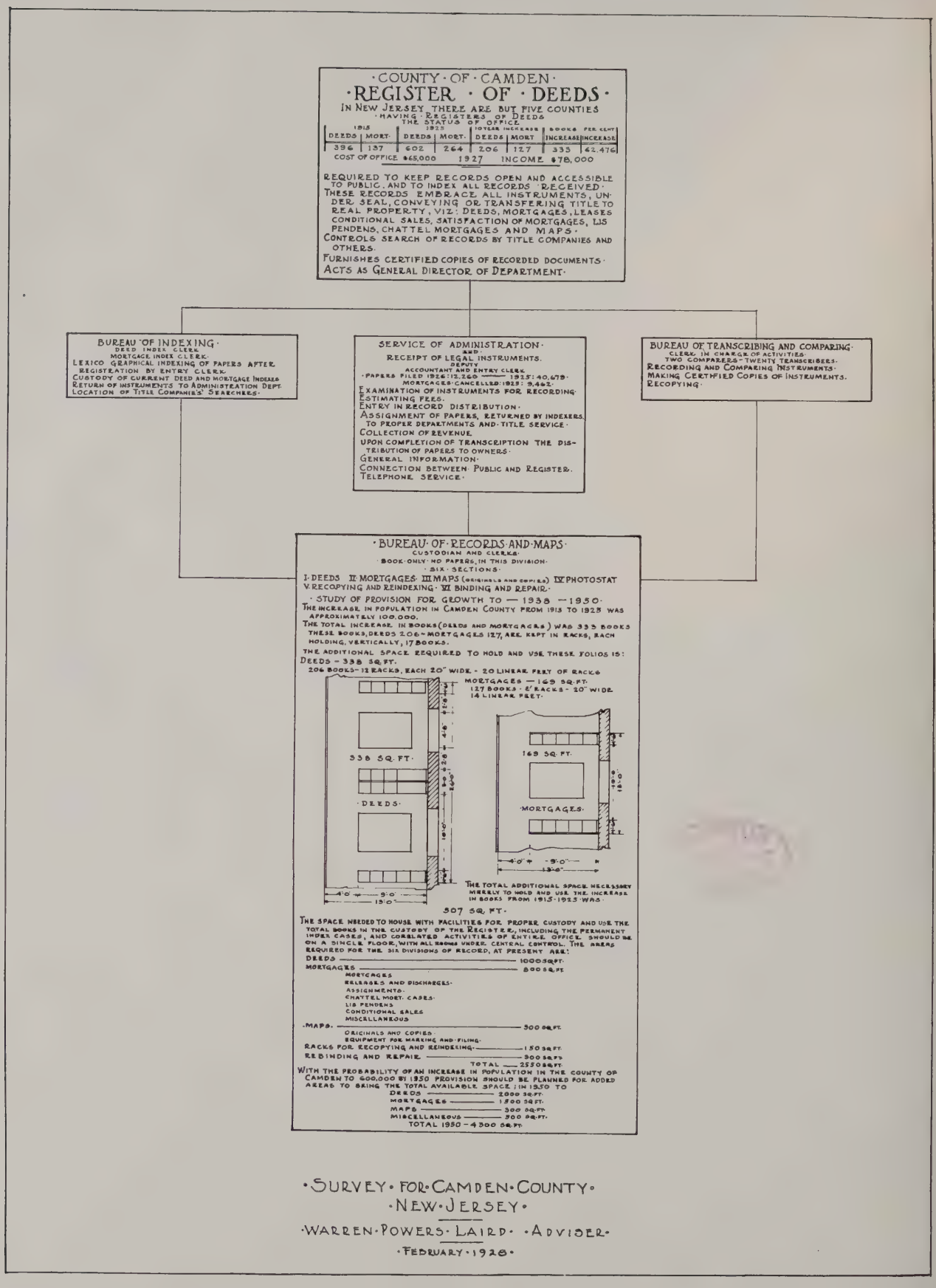
A public building is merely a place in which the public's business is transacted,—that is its essential purpose, and utility must be the objective of the plan. The question arises, how are we able to recognize or determine what constitutes utility in a public building? In the usual "Institute" competition an "architectural adviser" is chosen who prepares the basic program of the competition. This program usually allocates certain floor areas to the various departments or bureaus that are to be housed. How this allocation is determined is not generally known, but probably it is agreed upon between the architect and the heads of the departments or bureaus. The official or department head may or may not be competent to advise,—he may not even be familiar with the routine process of his office. Such is the result of our political scheme of "spoils to the winner" or election by a popular vote that has no knowledge of the functions of the department or the requisite ability of its head. The public building, as we have it, is not fundamentally right. It is true that the business of government has expanded greatly within the past two decades and that it will continue to expand with increasing population and new governmental functions. Today many states, counties and cities are building new state, county and city "office buildings" in which to conduct their business because their monumental buildings are found to be unsusceptible to alteration for greater usefulness. If we would measure the waste space in vast corridors, rotundas, excess story heights, unused attics and domes, it would be found that it would provide space for sizable and useful office buildings in which the public's business could be conducted economically and efficiently. Planning has now changed its emphasis from Beaux Arts *parti* to efficiency!

A fine example of recent and efficient building is that in Camden County, N. J. The existing court house became inadequate for the increased business of the county, and the board of freeholders employed Dr. Warren Powers Laird, of the University of Pennsylvania, to make a survey of the existing conditions and draw up recommendations for future procedure. Dr. Laird and his associate, Professor Pilcher first made an analysis on which were based the recommendations. The functions of county government are prescribed by statutory enactments which are the basis of the analysis. The analysis and recommendations were divided into four items:

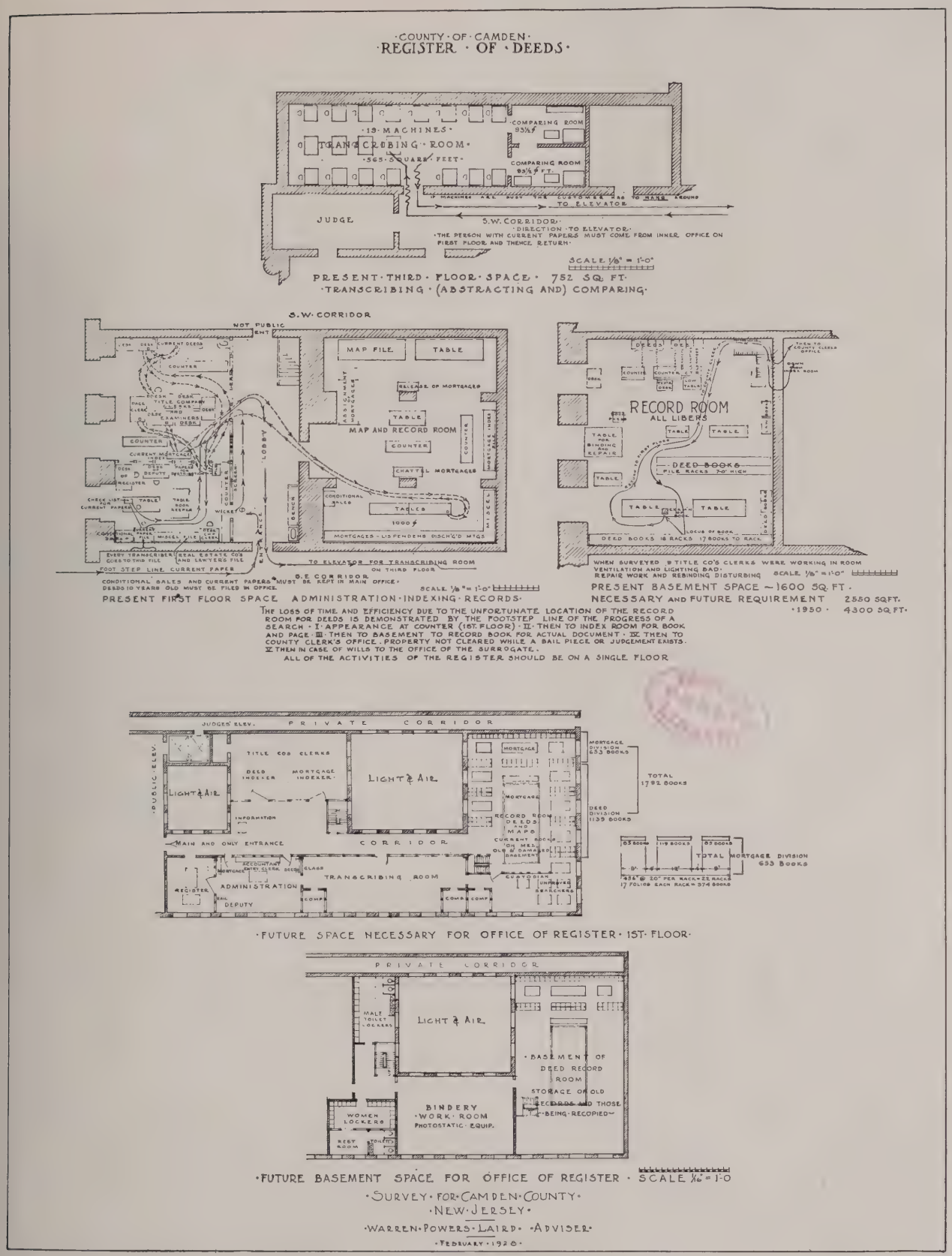
(1) The origins and inter-relations of state and county activities as provided in the statutes.
(2) The exposition of local or county activities to determine location and relation of parts.
(3) An analysis of the several county activities and their method of operation.
(4) A translation into plan diagrams of room arrangements with equipment suitable for present and future requirements.

Utilization of the present court house in connection with the new building was a factor in the problem, which involved certain changes in the existing structure. The proposed building operations are intended to accommodate the county business until 1950, and provisions are made for future extension when necessary.

A chart was prepared showing the relations between the various county and state departments or officials, both elective and appointed. A second chart shows the relations of the board of freeholders with the county officials appointed by them, the various committees of the board, the elective county officials, and the officials appointed by the governor. These two charts indicate the relationships and the functions of the county government. Specific charts were made for each department, bureau or official, on which are memoranda on its functions, personnel, nature of services, documents, files and equipment. From these data and their analysis were prepared plans showing the resultant space needs and the forms they should take, in both the new and old buildings, for the most efficient and economical operation. The survey in an important sense is a representation of cause and effect. The statutory and administrative causation of the many activities of county government determines a basis which con-



Detailed Analysis of the Functions of the Register of Deeds, showing Divisions of the Work, Various Kinds of Records, and the Area of Working Space Required for Each. This Type of Analysis was made for Each County Office.



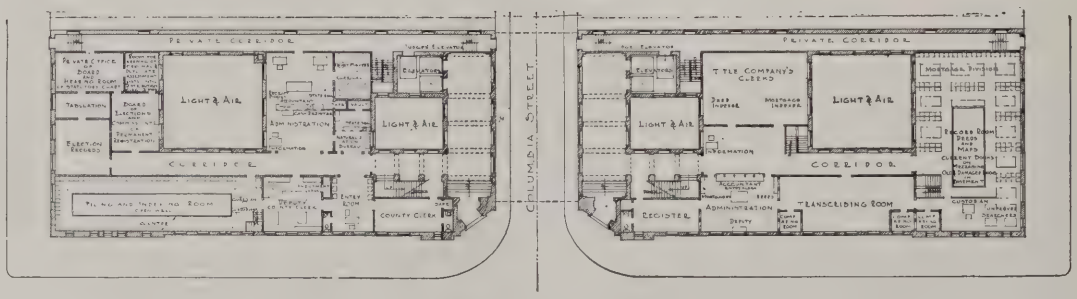
Analysis of Arrangement and Working Routes of Present Office of Register of Deeds, and Revised Arrangement Recommended for the New Court House.

stantly increases in its demands for efficient housing, resulting from the continued growth in population, commerce, wealth and social requirements of the community.

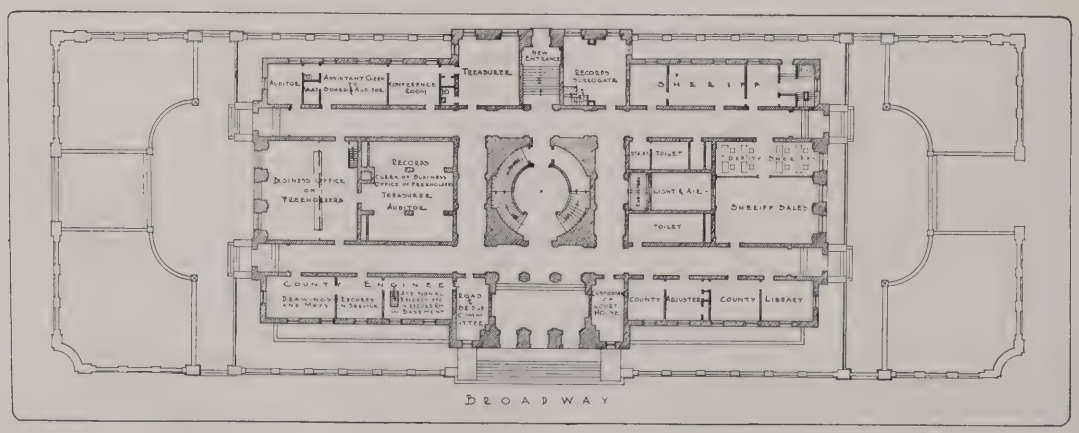
The solution of the problem of what constitutes a suitable public building can be attained only by such a method as is here described and, in part, illustrated. It is a rational and scientific method, logically developed from certain fundamental data. Should this method be adopted generally by public officials who are authorized to erect public buildings, such structures would emerge from the classification of our most wasteful, inadequate and architecturally inferior buildings into a classification comparable with the best of our industrial and commercial structures. Dr. Laird's report contained an estimate of the cost of remodeling the existing court house, dome repairs, the new court house, paving and other items. Charts showing the functions of the various officers, departments and bureaus, floor plans for their proper housing, plans for the new building and alteration of the old, block and traffic plans,—to the number of 36,—supplemented the written report. It is a splendid exposition of how to ascertain the record facts, to express the facts in charts and plans, and to estimate requirements in terms of future population.

A study was made of the routine of public business in each department, and the suggested plans were made so as to facilitate its dispatch. In the old building it was found, in some departments, that the routing of business was very unscientifically arranged, causing delay and inconvenience. The planning of any place wherein business is to be transacted is as definite and scientific as laying out a railroad freight yard. Our public buildings are usually mere aggregations of large and small rooms to which the work of the occupants and the public must be adjusted, and the result is that they are often wasteful, inconvenient and inadequate. The work must first be laid out, and to it the room be adapted. A freight terminal laid out with equal lack of intelligence would not function. Architects must realize that planning, in many instances, is a scientific and definite process similar to that of any other engineering project.

Dr. Laird has produced a splendid example of what constitutes logical and scientific planning, the process of its making, and its coördination into the form of a complete building. When this is done, the enclosure of the structure is but a further application of analysis and conclusion. Utility was here the basic consideration, and artistic enclosure the corol-

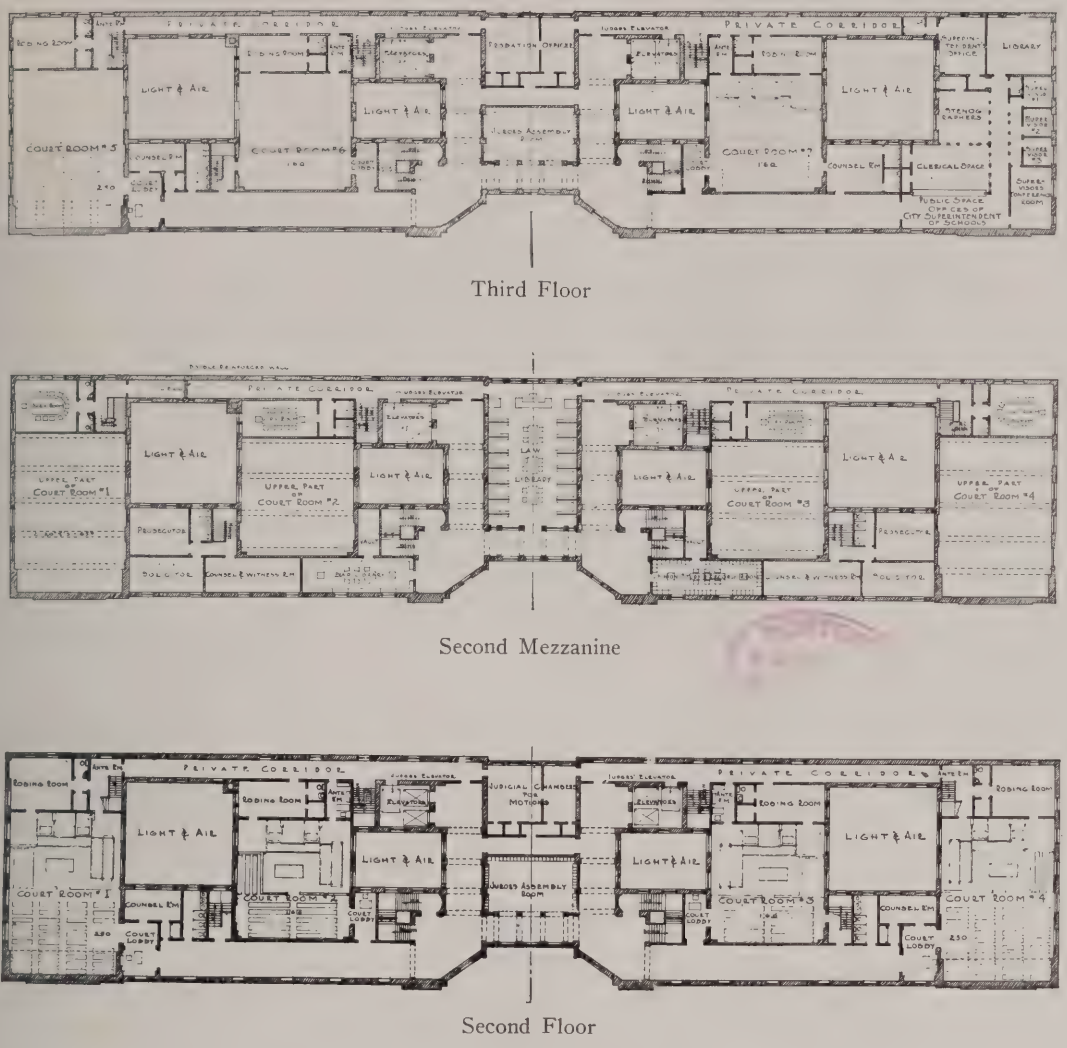


Proposed New Court House
Sixth Street



Old Court House

First Floor Preliminary Plan Showing Relation of Old to New Court House. Later Development Closes Columbia Street, Making a Lobby of this Area.



Preliminary Plans of Upper Floors of New Camden County Court House Showing Lofty Court Rooms and the Use of Mezzanines for Various Services. Fourth Floor Plan Is Similar to That of Second Mezzanine

lary,—the result being most happy and satisfactory. Making such surveys, analyses and recommendations is justly within the scope of architectural professional practice. In fact, no other persons are better qualified to perform such services. And, when allied with that other function of architecture, city planning,—and so employed jointly,—all the problems of governmental housing, urban traffic and community improvements will be solved in the best manner.

The Court House Annex Committee, of which Dr. Leslie H. Ewing is Director, as well as Director of the Board of Freeholders, made an intensive examination and study of Dr. Laird's survey and recommendations. The Committee referred it to the Board of Freeholders with a resolution recommending its adoption. The architectural adviser appeared before the Board and described all of the subjects treated, and the Board by resolution unanimously adopted the report. The improvements were authorized, Edwards & Green of Camden were employed to prepare the plans and supervise the construction, and the Board also employed Professor Lewis F. Pilcher, Vice-dean of the School of Fine Arts, University of Pennsylvania and former State Architect of New York, as consulting and advisory architect.

Editor's Note. Since the action here described of the Board of Freeholders, the City of Camden employed Dr. Laird to make a survey and recommendations for a new city hall and its location, together with a municipal bus terminal, and has retained Professor Pilcher as consulting and advisory architect. It has been decided that the new city hall will be built jointly with the new Court House Annex for reasons of economy and convenience. These will be published in due time in THE ARCHITECTURAL FORUM.

ARCHITECTS' RENDERING OF ENTRANCE PORTION OF NEW CAMDEN COUNTY COURT HOUSE

THE ARCHITECT AS CONSTRUCTOR

PART II—WHITHER DO WE TREND?

BY

WILFRED W. BEACH, ARCHITECT

IN a preceding article in these columns (May, 1928) the author attempted to set forth several reasons for assuming that architects should, in certain instances, for the good of the profession and in the interests of their clients, essay the actual execution of their brain products rather than assign it to low bidders and take chances on what ensues.

No claim of originality can be made for this idea. Several years ago, D. Everett Waid, discussing in *The Brickbuilder* the work of Mann & MacNeille, New York architects, took occasion to say, by way of comment: "The tendency among architects to sublet work and even to execute it by employing labor and contracting for materials themselves is perhaps due to the existence of many incompetent brokers who call themselves general contractors. That tendency may receive an impetus when architects realize that their proper standing is jeopardized by the growing power of a class of contractors who are dealing altogether with owners and with an avowed purpose of standing between owner and architect, and even employing architects as a subservient part of their own organizations. Desire for self-preservation should warn present-day architects that they must thoroughly qualify themselves with practical knowledge of materials and construction and structural design. Otherwise, they may find themselves on a salary basis, making artistic sketches for business men whose main interest is money profit, and who have not the æsthetic appreciation which animated the craftsmen-architects of old."

Mr. Waid prefaced this by saying: "Many architects are called upon to do such (construction) work occasionally and to a small extent; but perhaps only one architect known to the writer (other than the firm mentioned) possesses a construction department that has developed a complete organization trained to estimate costs, to buy material and hire labor, and to execute construction work according to its own standards."

But there appears to have been a more or less steady increase in such practice since the time at which Mr. Waid wrote, as witness the operations of Addison Mizner in Florida and those of Benjamin Marshall in Chicago and elsewhere. That there is a wholesome satisfaction in following this line of endeavor, which agreeably supplements that of creating the ideas in the drafting room, is not to be doubted. One has but to enjoy the experience to fully appreciate this!

Assuming that the practice of our profession is at once our calling and our means of livelihood, we are thereby undertaking certain responsibilities, not only for ourselves and our dependents, but for our clients as well. No matter which we hold to be of major importance, our obligations to our clients are considerable. The question is, are we carrying out those obligations to the best of our respective abilities by seeking to remain only the artistic designers mentioned by Mr. Waid? We are, if architecture is a thing of lines and renderings only. But we cannot help but realize that it is much more than that. If so, are we shirking our responsibilities by choosing only the easier and more enjoyable tasks and delegating what we deem the arduous and more risky details to those supposedly without our ideals, —to be evolved with or without our supervision? Is it enough for one to say "I've adopted architecture as a *profession* and see no reason for turning commercial by branching out into construction"?

But commerce is not necessarily criminal. It merely has criminally inclined barnacles clinging to its unexposed surfaces. One can be quite commercial without soiling one's delicate fingers. In fact, most of us would be considerably broadened, possibly improved, if we were privileged to have more business experience. This article is not, however, intended as an argument in favor of all architects' jumping at once into the building field in an effort to do away with the general contractor. It is to be considered more in the light of an academic discussion of the present-day trend of the general practice of design and construction; not, strictly speaking, an arraignment of either. It was inspired by the published statement, in considerable detail, of the secretary-manager of a Texas association of general contractors who may be assumed to reflect to a considerable extent the opinions of many others throughout the whole country. There he vigorously decried the effect of competitive-bidding contracting because it not only induces the owner to "indulge in the common pastime of 'whip-sawing' the three low contractors" but influences them to give "their 'subs' and 'dealers' the same or worse treatment than they complain of on the part of owner and architect."

Quite disregarding any theory as to what causes a contractor to mistreat his "subs and dealers," we believe that there are still many general contractors upon whom architects are justified in depending for the execution of high class work, but we agree with Mr. Watson, the secretary-manager just quoted, that competitive bidding does not tend to produce such.

Aside from any argument on the subject, however, there is really no sound theory for asserting that the architect has less right in the construction field than has the contractor or engineer in the preparation of building drawings and specifications. Perhaps each should stay in his own corner, though it

would appear that a distinct process of evolution is at work to bring him out. If so, why should the architect be the one to refuse to "evolute"? Tradition, conservatism, pride and inertia tend to hold him strictly to his professional sphere, though he may be missing considerable of the joy of creating by that very conservatism. No need to write volumes on the subject of an architect's experiences with low bid contractors. Probably no architect will aver that he enjoys watching over them or hiring others to do such detective work,—nor later explaining to the owner why certain things slipped by because the detective was neither omniscient nor omnipresent. We may agree with Mr. Watson that "even the ordinary honest contractor, faced with a possible loss through a price competition, forced bid, can find many ways to skimp his work,—giving construction that will pass the eye of the average inspector, but not giving the owner the quality he wants or thinks he is getting." But are we to agree further with him in his conclusion that "in the main, future construction work will be handled by firms which unite in one organization the functions now separately performed by architects or engineers and contractors?" It would appear that the contractors have thrown down the gauntlet,—that some of them, at least, are of the opinion that either the architect or the general contractor is to dominate the building of the future to the practical elimination of the other. We are not, at this writing, attempting to either prove or disprove this,—not even discussing the plausibility of the theory. We do know that certain general contractors have been striving for some time to eliminate the architect (and succeeding in doing so, insofar as their work is concerned), and that certain architects have successfully conducted their own construction operations. Whether or not these are phases indicative of a distinct trend in the evolution of the building industry, who can say?

Basing our dissertation upon these premises, we merely seek to show that it should be no more difficult for the architect to maintain his status as "the boss of the works" under such a new dispensation (or is it a swinging back of the pendulum to an older order?) than for the contractor to usurp that function. Nor, we maintain, will the architect sacrifice any of his dignity by becoming a practical builder. If there be caste in the personnel of the industry, present-day architects must assume their stratum to be located somewhere between the high level of the creative designer and that of the aforesaid detective. May not that of the honest builder be assumed to be at least as high? Obviously, being good builders is better than being poor detectives, which the gentleman from Texas considers us. Perhaps, as usual, "the proof of the pudding is in the eating." It is of less import to convince members of our profession that they should add construction forces to their organizations than to offer assistance to those who contemplate such an undertaking. Such a departure is not, to be sure, to be lightly undertaken. It is a serious matter and, once decided upon, introduces more novelties into one's practice than merely the buying of materials and the hiring of mechanics.

As we are often made painfully aware, one of the most important of an architect's functions, perhaps the most vital to his practice, is that of getting the business to keep his office going. So long as he adheres to a strictly professional status, his competition is, to a large extent, confined to that with others in the same line. He seldom has opportunity to compete with contractors who offer "planning service," even if he dared to do so. Such business is generally "cinched" by trained salesmen before the architect has heard it is in prospect. And it is into the field occupied by these contestants that the constructing architect is entering in order that, for the good of the owner as well as for the profit of the architect, the independent existence of the latter shall not be too greatly circumscribed. The percentage of his former clients and of those new clients naturally coming to him, who may be convinced that his scheme of "cost-plus" building is quite sane, may be too small to warrant the change in policy,—probably it would be. In any event, the architect may be presumed to be seeking to enlarge his clientele by means of his new form of practice.

He must go out after new business. In order to best fit himself to secure it, he must first convince himself that he has better buying ability and better construction methods than (or, at least, equally as good as) those possessed by others. This may not be difficult. He has learned by painful experience what are the outstanding shortcomings of the average general contractor. Summed up, chief among these are:—

1. Indifferent buying.
2. Straining credit to the detriment of close buying.
3. Buying from favorites or to repay obligations.
4. Too little price competition, for various reasons.
5. Poor foremanship.
6. Too much dependence upon foremen.
7. Too meager instructions to foremen.
8. Insufficient expediting.
9. Unbalanced expediting.
10. Careless general supervision.
11. Poor bookkeeping.
12. Slack (or nil) cost accounting.
13. Intense application to business getting at the expense of other activities.
14. Substituting shrewdness for efficiency.

The list might be indefinitely extended. It may be considered the natural result of the competitive bidding system and the temptation it offers to the crook or the shyster. This is not an indictment of all general contractors, by any means, but of the many who have not the inherent honesty or strength of character to fortify them against temptation. The experienced architect is well aware of the more gross deficiencies of these gentry and can, when he seeks to displace them, so equip his forces and so conduct his operations as to eliminate such defects and others.

In the matter of buying, he has a considerable advantage over the ordinary general contractor,—as has any builder who installs his own drafting room. He is not limited as to the number of copies of drawings he can send out for factory bids, nor has some one else the fixing of a dead line when those bids must be in. He can assiduously seek the lowest prices, consistent with satisfactory output. Contractors too often buy through accustomed channels, even when other supply concerns are much more in need of business and are willing to bid accordingly. General contractors are also likely to favor those whose bids have been used in securing the work, regardless of whether or not their prices are bedrock. This is ethically proper, to be sure, but it is not of particular benefit to the owner. For instance, a local contractor on a certain remodeling project would have used a bid of $1,500 for the millwork, the lowest local price. But the owner entrusted his work to a constructing architect, who located a good mill 800 miles away which actually needed the business and delivered the goods, "f.o.b.", for $750. Nor is such an event unusual. We have all remarked upon the unaccountable variation in bids that is always to be expected on minor items. Another case in point is that of three bronze-plated grilles needed to fill certain openings in an office counter. The concern supplying the counter priced them at $50 each. Bids from ornamental metal concerns ranged from $45 to $250 for the three,—and they were ordered and delivered at the lowest price. For a country bank building, the two local hardware dealers (one of whom any local builder would surely have patronized) each asked $200 for the finish hardware. The constructing architect bought the same bill from a wholesale house for $135. The wholesaler wanted $87.50 additional for kick-plates, thresholds and push-bars, not on the original list. These were obtained from a manufacturer for $67.50. Verily, there is much of interest in the life of a purchasing agent!

Another advantage possessed by the architect is that he has not someone else's restrictions to prevent his getting prices on materials of different values. The highest priced, which might be the only material which would satisfy a specification calling for strictly "first class," may not be absolutely necessary to the location,—but a contractor's attempt to substitute, even at a price allowance, might be viewed with suspicion. He is supposed to profit by all changes, hence had best be held to the terms of the contract. Departures therefrom are not to be encouraged. But the constructing architect, doing business under a "cost-plus-lump-sum" contract, has no such inhibitions,—he can make all such changes to the sole benefit of the owner. He need not invariably buy "first class," when the particular need does not require it. And he has the further advantage of being able to pay cash,—with the owner's money,—and to take all benefits of cash discounts. It will also be found that prices quoted on a strictly cash anticipation are frequently lower, even when not subject to discount. In the matter of selecting foremen, one must exercise the greatest caution and acumen. A foreman can make a project successful, with proper support, or he can mar it in short order. Good foremen are not easily secured. Good general foremen are exceedingly scarce. The policy of trade unions in denying their members permission to learn or work in more than one trade doesn't make for the training of general foremen. They must arrive outside of, or in spite of, union restrictions. But general foremen are to be found, nevertheless, and should be well paid,—they must be properly remunerated in order to be held, and they must be handled with tact. They know that they know, but may not be so sure that the architect does. They have had experience under all sorts, and their respect for the new employer needs to be carefully developed.

It is not to be supposed that any architect will, without previous experience in building construction, suddenly embark upon such an enterprise on a large scale. But most of us have, at one time or another, carried out minor operations through direct employment of labor, and have executed larger work by means of multiple small contracts to the exclusion of a general contractor. If this further comprehensive step is to be taken, however, it must be only after due consideration and proper preparation.

One must decide what crafts will be subcontracted and what will be directly employed; whether the project will be "union" or "open shop," and what equipment is necessary. The latter had best be procured only as needed for each project. Perishable items, such as buckets, hose, rope and material used and destroyed in temporary construction are to be charged to the particular work; others, such as barrows and general building equipment, are to be charged to the builder's overhead and remain his property. The larger items, such as concrete mixers, hoists and the like, can be either purchased or rented as is deemed advisable. In either event, the owner should pay rental for such items of major equipment as are used on his work.

Now, to return to the important subject of getting the business. If the architect has already established his prestige as a conservative estimator and the type of man who is dependable,—who will carry out his obligations, if it is humanly possible so to do,—he has built an excellent foundation upon which to erect his new business. His statements will be convincing and will carry weight accordingly. He can, among other things, show how work by his own forces will reflect these advantages to the owner:—

1. It can be started without waiting for drawings to be completed and without loss of time in taking general contract bids, thus materially reducing carrying charges.

2. The architect, and the owner through the architect, will exercise more direct control over the laborers and minor contractors.

3. The builder, by using the owner's funds instead

of his own, does not have to add interest to his carrying charges, but can buy in the lowest markets and take advantage of all possible discounts.

4. The cost of a builder's bond is also saved.

5. The owner finds himself paying lowest costs for the most suitable materials and appliances, instead of paying the highest prices a contractor is able to collect for what must be inspected and judged.

6. Changes can be made at net cost. The "extra" bugaboo is avoided.

7. By the judicious use of premiums and bonuses, especially good and speedy performances may be secured, without being found unduly expensive.

8. Occupancy of the premises or any part thereof can be had by the owner before completion, without question or added expense.

9. In case the work is prematurely terminated, adjustments can be affected with minimum trouble. This is sometimes valuable in cases where churches or lodges have not been able to collect subscriptions. They can quit if and when their money runs out.

10. The one point in favor of competitive bidding contracting is that the owner is thereby supposed to know in advance what his building is to cost. Barring extras, he does acquire this information. But he is a long way from knowing if it is costing as little as it should or if he is sure to get what he is paying for. With the architect as builder, the owner does get what he is paying for and at actual net cost. More than that, he should not expect. It is admitted that general contracting is a gamble,—with the owner a novice playing the other fellow's game. For that reason, he hires the architect (if he thinks he needs him) to look out for his interests. But frequently the contractor is smooth enough to have the architect set aside, thus removing one of the gambler's obstacles.

Having "sold" the commission, if he be so fortunate, the architect proceeds with the drawing up of a contract, the approval of preliminary sketches, the preparation of working drawings, the selection of a general foreman, and the procuring of prices on the items first demanding purchase. The contract form included here was most carefully evolved from several under consideration and has been repeatedly used. The fundamental idea is that it is merely an expression of mutual understanding between two parties who have absolute confidence in each other and merely desire a record of their understanding. Such a contract should never be entered into on any other basis. It will not safeguard an owner against swindling by a dishonest builder any more than will any other form of cost-plus contract. There is no way of enforcing honesty in a purchasing agent if he chooses to be a crook. One can only check him up and get rid of him. In this sort of a contract, the architect (or builder) is merely acting as a purchasing agent, skilled in the buying of labor and material to produce a building.

The amount of his remuneration for such service is presumably discussed and arranged at the time of his employment. If he be the type of architect we are discussing and addressing, he has not been accustomed to cutting his prices to get business and will not now begin to do so. Naturally, the proper fee for the service we are describing is a combination of the customary architects' charge and the ordinary good contractors' profit. Experience will prove that new work costing upwards of $50,000 can be handled to advantage at such combined rate, but that alterations and minor operations at such a fee will not be particularly remunerative. Perhaps work costing over $500,000 could be done for slightly less, but it is hardly a safe assumption. We are discussing work done for profit and not for the average architect's "living wage." It is assumed that both the owner and the architect-builder are to profit by the deal. Close scrutiny of this contract form is recommended to any architect who proposes to conduct building operations. It can, no doubt, be improved upon, but it should prove a good basis upon which to found an agreement. Specifications used with it need no general conditions and but few supplementary general conditions. But one's instructions to the men on the site must be most ample and explicit. These will be set forth later in another article to be published in THE ARCHITECTURAL FORUM.

The subject of the various numbered articles of the accompanying contract may be summarized as:—

1. Description of the work.
2. Drawings and specifications.
3. Minor changes in the work.
4. Major changes in the work.
5. Expediting the work
6. Purchase of materials.
7. Invoices required.
8. Advancement of funds.
9. Itemized statements.
10. Payment of builder by owner.
11. Definitions of terms Equipment, Tools and Supplies.
12. Rights of owner's representative.
13. Lien indemnity.
14. Advertising signs.
15. Insurance.
16. Payment for builder's services.
17. Stopping of the work.
18. Arbitration.

These subjects might of course be incorporated as the headings for each article of the contract. A contract form as used by the author is given in full on the page opposite and on the page following.

THIS AGREEMENT, MADE this day of

Nineteen Hundred
BY AND BETWEEN of hereinafter

called the "Builder," and
hereinafter called the "Owner."

WITNESSETH that the Builder in consideration of the agreements made by the Owner, agrees with the said Owner as follows:

Article 1. The Builder shall and will secure all material and provide all labor necessary to the design, erection and equipment of

the Owner on its property located in as shown by the preliminary drawings and specifications prepared by the Builder and approved by the Owner, which drawings and specifications are identified by the signatures of the Parties hereto and made a part of this contract.

Article 2. The Builder shall furnish such further working drawings, specifications, details and explanations as may be necessary to fully describe the work to be done. All drawings, blueprints, and specifications are and remain the property of the Builder, the Owner, at option, retaining a set of each as a permanent loan.

Article 3. The Owner shall be at liberty to order minor changes from the approved drawings and specifications and the Builder shall revise his work to conform to the same (provided that due notice is given of the change and that said change does not involve delay in the completion of the work) without in any way affecting the terms of the contract.

Article 4. The Owner shall also be at liberty to order major changes from the approved drawings and specifications under the same conditions as set forth in Article 3, except that for each major change the Builder shall be allowed a fee of fifteen per cent (15%) of the estimated cost, such changes only to be made when authorized in writing by the Owner.

Note: Any change involving an additional expenditure of five hundred dollars ($500.00) or more shall be considered a major change.

Article 5. The Builder shall start the work at the site as soon as sufficient material can be delivered to insure continuous rapid progress of the whole work and shall do everything possible, consistent with good workmanship and minimum cost to push all parts of the work to completion. With the consent of the Owner, such premiums as are agreed upon between the Parties hereto may be paid to get quicker deliveries or secure overtime work at the Building, the extra cost of such procedure and of all personal expediting or tracing of shipments to be paid for by the Owner.

Article 6. The Builder will purchase all material and labor for the work at the lowest possible prices consistent with the grade needed, whether buying in the open market or by competitive bidding as may be found most expedient, and will supply such additional copies of prints and specifications as are needed to obtain lowest prices. The Builder will also take advantage, on behalf of the Owner, of any tenders which the Owner may receive for material suitable for the building and will also make use of such additional second-hand material as the Owner may provide for the work. All orders and contracts for material, etc., involving an expense of

or more shall receive the approval of the Owner before being placed.

Article 7. Invoices of all materials shall be secured by the Builder in triplicate. Original invoices shall be checked and approved by the Builder and shall accompany the monthly statements mentioned in Article 9. Duplicates will be kept on file at the Builder's Home Office.

Article 8. The Owner shall advance to the Builder, as needed, sufficient funds to meet all payrolls when due and to pay bills for materials in time to take advantage of possible discounts. In case it may be necessary to make advances before the actual payrolls can be made out or invoices furnished, then such advances shall be based upon estimates supplied by the Builder as to the amount of funds so required.

Article 9. The Builder shall furnish the Owner, on or about the fifth day of each month during the progress of the work, an itemized statement for the preceding calendar month, as defined in Article 10, of all labor, material, etc., incident to the work under this contract, and of all funds advanced by the Owner during such period. These statements shall be accompanied by the original invoices previously mentioned.

Article 10. The Owner shall pay to the Builder within three days after receipt of monthly statement above mentioned, the balance due the Builder up to the amount of the entire actual cost incurred during the preceding month; such actual cost to include the net cost of all materials, supplies and labor (including superintendent and foremen) provided; freight, express, and cartage charges; prevailing rental for equipment, etc., required for economical construction and for the time actually needed upon the premises; cost of fuel, power, light and water used during construction; net cost of sub-contracted work, materials and supplies; traveling and hotel expenses, incident to the work (and of special help when authorized by the Owner); cost of permits, fees and royalties; all premiums for insurance

carried on the work; all incidental expenses, liability and outlay incurred in connection with the work, such as telephone and telegraph charges, personal tracers, temporary sheds, fences, offices, toilet rooms, walks, soil tests and other necessary tests. Actual costs as above outlined give the Owner the benefit of all cash and confidential discounts of every nature.

Article 11. The following differentiation shall be made between the terms Equipment, Tools, and Supplies in order to reckon the net cost as described in the preceding Article:

"Equipment," on which the Owner shall pay rent, will include concrete and mortar mixers, excavators, wheel and slip scrapers, steam engines, elevators, hoists, derricks, drill machines, electric motors, gasolene engines, forges, pneumatic hammers, pumps, power saws, platform scales, wagons, surveying instruments, temporary heating apparatus, typewriters and desks.

"Tools," furnished by the Builder at his own expense, will include all small portable hand tools and mechanics' trade tools except such perishable items as will be charged under "Supplies."

"Supplies," charged to the Owner as part of the cost of the work, will include all special or perishable items necessarily purchased for the particular work. These remain the property of the Owner and may be disposed of by him at the completion of the work.

Article 12. The Owner's representative will be permitted access at all times to records, correspondence, account books, drawings, specifications, vouchers, invoices and payrolls relating to the work for the purpose of auditing the expenses incident to the work and gaining other information relating thereto.

Article 13. The Builder shall idemnify the Owner and save him harmless from all mechanics' liens upon the premises on which the building is located arising out of the work to be performed under this contract, provided that the Owner shall have paid to the Builder the amounts due at all times.

Article 14. The Builder may display at least two advertising signs in conspicuous places about the premises, such signs to be furnished, erected and removed all at his own expense. Other billboard privileges at the site remain vested in the Owner.

Article 15. The Builder shall provide such liability and compensation insurance as may be necessary to protect both Parties to this agreement (and as part of the cost of the building) except that the Owner shall provide fire insurance in amount sufficient to protect the interests of both parties to this contract, including building equipment and tools. At the option of the Owner, the Builder will also carry accident and public liability insurance, otherwise it is assumed that the Owner elects to assume such risks.

Article 16. In addition to the actual cost of the work as herein before defined, the Owner shall pay to the Builder for his services and for the use of his organization and tools in the construction of this work, the sum of

in installments as follows:

(Note: It is understood that the foregoing partial payments represent approximately 85% of the fee earned by the Builder up to the time such payments are stated to be due.)

Article 17. If the work should be stopped for a period of one month under an order from the Owner or any Court, through no fault of the Builder or anyone employed by him, or if the Owner should fail to pay to the Builder, within ten days of its presentation and maturity, any sum due to the Builder, then the Builder may, upon three days' written notice to the Owner, stop work and terminate this contract and recover from the Owner the balance unpaid for services under Article 16 and also full payment for all material furnished and all sub-contract and other work executed as well as loss and damages sustained upon any plant and material and upon any incompleted sub-contract, together with all cost of collecting such unpaid balance.

Article 18. In the event of any disagreement arising under this contract between the Parties hereto, it shall, upon written notice of either Party, be submitted to three arbitrators for decision. Each Party shall choose one arbitrator within five days after receipt of such notice, the third to be chosen within five days by the two thus selected. The decision of all or a majority of said arbitrators (which shall be rendered within.....days of the appointment of the third arbitrator) shall be final and binding on both Parties to this contract. The expense of such arbitration shall be agreed upon in advance and shall be borne equally by both Parties.

IN WITNESS WHEREOF the said Parties to these presents have hereunto set their hands and seals the day and year first above written.

....., Builder,

By .....

.....

..... Owner,

By .....

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BOOK DEPARTMENT

SOME EXAMPLES OF THE MODERN FRENCH ARCHITECTURAL TYPE

A Review by
WALTER F. WHEELER

THOSE students of architecture who are accustomed to seeing in one type a definite relationship to what has gone before, find that a study of distinctly "modernistic" architecture involves something of a shock. The merging of Tudor forms into Jacobean and later Stuart is of course readily accounted for; so is the easy and graceful transition from Queen Anne into Georgian and from Georgian into Adam. Architecture like nature demands time if she is to bring forth perfect work; she refuses to be rushed or hurried, and therefore her work possesses qualities which because they are enduring or lasting have been used and re-used, adapted and re-adapted, and the end of their vogue is far from being in sight. Now, however, there is being offered to an astonished world an architectural type which we are told is modern, present-day, and representative of the spirit of the age,—a type which disclaims inheritance of any kind from the past, and which implies if it does not express contempt for the past and all that it represents,—a type formulated almost literally overnight, and depending for its popularity apparently upon its novelty,—its being wholly and completely "different," and the equivalent probably in the realm of architectural design of the modern system of steel construction in the realm of building. Will its vogue last? Who can tell! But already its most extreme manifestations are condemned, or to be more exact, in America at least, they have never been tolerated, and even the least discerning can already read the hand writing on the wall which foretells its waning,—the time when much if not all of what has already been done will have to be discarded or re-modeled out of all recognition, a course which has already been found necessary with buildings of some of our earlier American radicals, when their work, after ceasing to astonish (and therefore to please) finally became too wearisome to be borne.

This work on modern French architecture has been edited and prepared by two well known British architects, and they have evidently selected from a wide field merely the examples calculated to offend as little as possible the English and Americans to whom the volume is presumably directed and who refuse to either acknowledge or follow the leadership of the French. A large proportion of the 100 plates show the fronts of shops or the facades of business structures, which depend for effectiveness upon use of the bold and often striking treatment which this particular type of architecture affords.

The editors say: "The forms of architecture, through their essential character of permanence, have always been somewhat slow to reflect the intellectual and emotional tendencies of any epoch. And yet today, largely perhaps because we realize that our buildings of the present may no longer be suitable for the needs of tomorrow, we find a tendency for passing fashions in design to be reflected readily enough in buildings. But it is only in buildings of certain categories, those which make no claim to a character of permanence or grave significance. It is not in great public structures, which must support the judgment of successive generations, which stand as an expression of a social idea rather than as that of a modern suitability to purpose, that we find exemplified the latest developments in modern proportions,—dictated perhaps by the latest experiments in structural methods,—and the detail reflecting what we may call the trend of the moment, that mysterious urge toward design of a certain type which affects alike the painter, the sculptor, the dressmaker, and the architect.

"On the contrary, it is in the smaller, and to this extent the less important, examples of building and craftsmanship that can be detected those signs of change and of experiments,—some of which latter may bear no fruit,—but which in their aggregate may eventually contribute to form an architecture worthy some day to be designated as "the modern style." It is in the shops, the homes, the hotels, the cafes, the buildings sheltering activities which lie at the door of everyday existence, that we find the reflection of a desire for new expression. These buildings make no claims as regards posterity; they are buildings of today, for modern people. They reflect what many modern people think, and do, and want. Hence in this volume the paucity of large important work in the modern manner. Little of it exists as yet, except on the drawing board; and what we show today, work by no means picked at random, but chosen because of its intrinsic interest, may serve as the *hors d'œuvre* to some future architectural dish. The work is valuable to architects in illustrating what are probably the most pleasing and satisfying examples of the type,—examples which may perhaps continue to please when the vogue of the style has waned and when popular taste has been directed toward use of conservative architectural types.

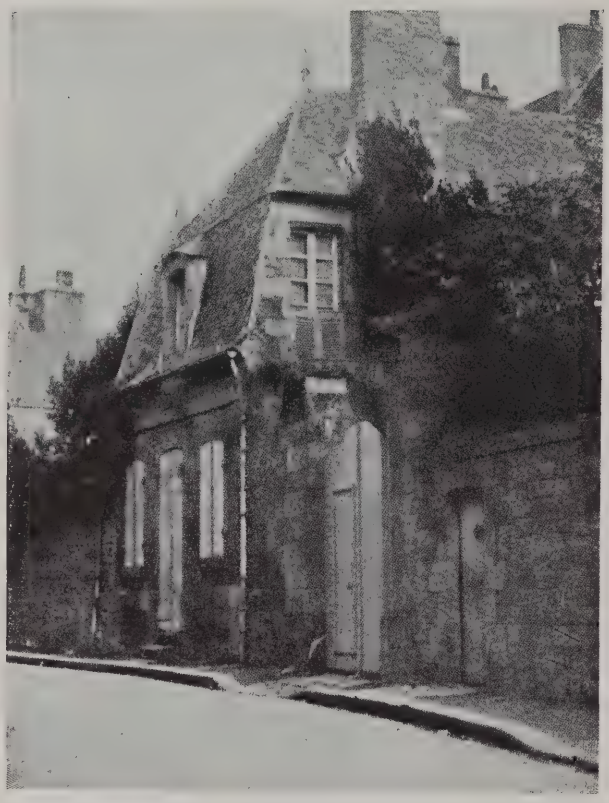
EXAMPLES OF MODERN FRENCH ARCHITECTURE. Edited by Howard Robertson nad F. R. Yerbury. Text and 100 plates, 8½ x 11 ins. Price $10. Charles Scribner's Sons, New York.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

French Farm Houses, Small Chateaux and Country Churches

By Antonio di Nardo

With Preface by Paul P. Cret



THE buildings of no country offer more in the way of inspiration for present-day architects than those of France. French towns and villages are filled with fine old houses and shop buildings, and the countryside abounds in farmhouses, farm structures singly or in groups, manor houses large or small, and the rural churches and wayside shrines which are among the most beautiful buildings of their kind in the world. All these structures by reason of their direct and practical designing supply the best possible precedent for modern work.

This volume contains more than 300 half-tone illustrations of buildings of this character, and in many instances illustrations of details are given, with drawings showing the bonding of brick or the arrangement of half-timber construction. *The work would be worth many times its cost to any architect interested in the design of domestic buildings and small churches.*

176 pages, 12 x 16 ins.

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THE FORUM AND THE PALATINE. By Christian Huelsen. Translated into English by Helen H. Tanzer. 164 pp., 7½ x 10 ins. Price $3.50. H. Bruderhausen, New York.

THIS volume is a new edition of Professor Heulsen's *"Forum and Palatin,"* published in 1926, with extensive changes, and containing 100 pages of text, 66 plates, and a large plan of the Forum and Palatine. It is interesting to note how the Forum received its name. Below the Palatine lay an open market place into which peasants would bring their wares to sell. The old Roman scholars explained the derivation of the word Forum from *ferre,* to bring or carry. This open space was also used for processions, celebrations and funeral games, and was bordered on two sides by stalls or booths. In Imperial times, the Forum was an important part of a network of streets. In the manner of a guide book, the reader of this volume is taken through the streets, pausing at each place of interest, where a detailed description is given, sometimes including an elevation, detail or floor plan, which has significance. The temple of Vesta was one of the oldest in Rome. It was a circular building, reminiscent of the oldest peasant huts of straw and waddles. The foundation of concrete *tuffa* blocks supported 20 Corinthian columns. The *cella* had walls of solid marble, probably without windows, and received its light through the door and an opening in the summit of the roof. In the center of the *cella* was a hearth where the virgins were required to keep the sacred fire burning forever. Men, with the exception of the *pontifex maximus,* were forbidden to enter the temple, and women were admitted only during the festival of Vesta in June. The tent-like roof, as we learn from representations on coins, had a sort of chimney, probably of bronze, in the shape of a flower, which protected the interior and the hearth from rain. The dwelling of the six vestal virgins was called *atrium vestal,* from a large courtyard in the house, embellished with gardens. The *tablinum* had three single cells on each side, supposedly for the sacred vessels of the priestesses. The living quarters were in the upper stories, as the house had at least three or four floors.

The first building dedicated to the Christian religion, was built between 526 and 530, and not much later, the Church of S. Maria Antiqua was established in the library of the Temple of Augustus. During the tenth and eleventh centuries, the destruction and burial of the Forum went steadily on, and by the middle of the twelfth, it was a pathless waste. The barons of the day built their towers largely from materials quarried from the ruins. In the fourteenth century, when the seat of the papacy was removed to France, Rome suffered annihilation and destruction. With the return of the pope, toward the end of the century, great activity began in the building of churches, with one unfortunate result,—that the Forum was among the ruins that served as a quarry. This continued through the fifteenth and sixteenth centuries. Cattle grazed above historic spots, and the common name was *"Campo Vaccina"*. The name *"Forumn Romanum"* was forgotten for centuries,—indeed it was believed to be in an entirely different locality. At the end of the eighteenth century, a revival in the study of archæology brought about methodical excavation. After 1870 the new Kingdom of Italy uncovered

the palaces of the Cæsars on the Palatine, and other important monuments were excavated until 1904, when excavations ceased. The Palatine before imperial times was the primitive center of Rome. The legend runs that when the swampy valley of the Velabrum was flooded, a little chest containing the twins Romulus and Remus drifted to land at the fostering fig tree. It was in the wolf's den at the foot of the hill that the twins were nourished by the she wolf, and later rescued by Faustulus. On the summit of the hill, was the hut of Faustulus, where Romulus is supposed to have lived. All these spots were maintained and venerated up to Christian times, but no vestiges of their remains are to be seen today.

An excellent idea of the arrangement of a well-appointed Roman house of the middle of the first century B.C., may be gathered from the excavated house, thought to be the birth place of the Emperor Tiberius. The house faced east, and we can still recognize an *atrium* of the usual shape, with rooms surrounding it. The vestibule was covered over in the first century A.D. by the foundations of the Flavian Palace. There are several well preserved rooms adjoining a second court toward the rear, which are approached by a passage leading down. The rooms are decorated in the architectural style of Pompeii of the first century B.C. Wall paintings represent statues, and frescoes imitate a facing of colored marble. In the middle room on the court, a large painted window with a pediment, gives a landscape view, and on the mouldings there are paintings of sacrificial scenes, and of women at their toilet. According to ancient usage they were protected by shutters. Of the imperial buildings of the Palatine, the general arrangement of the Palace of Tiberius is of interest. The buildings were grouped around three right-angle courts, the center area being an oblong of 100 by 80 meters. The facade of the Palace of Augustus, or Flavian Palace as it was called, because it was restored and enlarged by three Flavian emperors, may have had a colonnade of moderate height, above which rose the walls of the side and center rooms. From the portico, three doors led into large halls, the center hall being the throne room, 52 meters wide, and the barrel vaultings covering it were 10 meters wider than the nave of St. Peter's.

With the transfer of the imperial residence from Rome to Byzantium, there began the slow decay of the Palatine. From the eighth century up to the present time this work traces interesting discoveries and excavations. For the student of classical architecture and history, the volume gives excellent detailed information.

SKETCHES ON THE OLD ROAD THROUGH FRANCE TO FLORENCE. By A. H. Hallam Murray, accompanied by Henry W. Nevinson and Montgomery Carmichael. 328 pp., 6 x 9 ins. Price $5. E. P. Dutton & Company, New York.

THREE Englishmen, an artist and two writers (who know architecture), set forth on the time-honored route that leads from Normandy through France to Florence. Wisely, they do not travel by the "*rapides,*" the de luxe expresses that whirl the traveler through space at a speed that makes the milestones seem like telegraph poles. Well aware that their route is one of the richest in art treasures of any in the world, they make the journey far more leisurely,—by the motor that follows the byways, by the barge that slips noiselessly down river or canal, or by the jerking little railway train that stops at

GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency anywhere in America even a few years ago.

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every way station, permitting the traveler to alight, stretch his legs, refresh his mind and observe the people who live there. Independent of time tables and Baedekers, they follow where fancy and interest lead, aware that if they miss the last train today, there is always another tomorrow. The artist is A. H. Hallam Murray, who sketches along the way in the vivid colors the landscape dictates, these to appear in this volume in handsome, full page color prints; or in demure sketches tucked away at the bottom of the pages with delightful unexpectedness. The writers are Henry W. Nevinson, who tells the story of the journey through France, and Montgomery Carmichael, who picks up the tale at the Italian Riviera and carries it on through Florence, the city that is all things to all travelers.

Just as the artist adds something to the picture which the camera alone does not record, so the authors have written into this book more than a mere record of their journey or a description of cathedrals, churches and castles they visited along the way. In these artistic monuments they see the living story of the people who built them, how they lived, what they thought, and the traditions which prompted their work. The writer turns philosopher in a pleasantly whimsical way. As he passes through Avignon where lived Laura when Petrarch sang of her, he pauses long enough to wonder why Petrarch did not love his own song less and the beautiful, pining Laura more, that she might have lived for him. And why do Frenchmen, the most skilled on earth in the art of conversation, turn suddenly stolid and silent when they sit down to their table d'hote? At Arles and Nimes, in the country which Caesar snatched from the Gauls, he does not reconstruct for the reader the old Roman ruins that stand there. Instead he talks of the self-confidence of an ancient people who could impose their peace on the earth and mark their conquests by memorials which neither time nor kings have been able to duplicate or destroy. In what remains of the amphitheaters, the people still witness bloody games between man and beast. How could the Romans know "the immortality of cruelty or see mankind's perennial joy ir drawing blood?" In the church which the Romans built to the nymphs at Nimes, he explains "we are not much interested in the sizes of the stones, which are large, nor the decoration, which is said to be good; but we would give much to know what the builders really thought about the nymphs, what was thought by the priests who were paid for their services, and what was thought by the people who came to worship them." As our travelers pass the Riviera, they avoid the modern road which leads past the luxurious hotels, the palatial homes of the English turned invalids ("as comfortable as any pig sty"), to follow the higher mountainous road and glimpse the ancient city as it was built among the hills.

The co-author, Mr. Carmichael carries this spirit through the journey in Italy, to prove that he is interested in the people who made the art as well as in the art itself. One learns more of a country, he explains, by studying its industries than its museums. He tells of the marble quarries at Cararra where the great blocks of marble are moved up and down without a derrick, without a steam crane in sight, by ropes, slowly and painfully, a distance of 6 inches at a time, by men who work with a wild enthusiasm and chant in rhythm as they pull, to make the task thrilling, not drudgery.

At Genoa and Pisa he turns architect again. There is the lighthouse at Genoa, 250 feet high, visible to the mariner on the Ligurian sea for a distance of 40 miles. Sorrowfully his guide admits that the light at New York is taller, but he is consoled when the stranger explains that the light at New York was built with modern appliances and is new, whereas that at Genoa has stood since the fifteenth century, and therefore is the work of the mightier brain. Tradition has a two-headed legend that the architect threw himself from the top of the tower that he might never have to build another *lanterna* for any other nation,—or else he was so thrown for the same reason! When he sees the leaning tower of Pisa he declares with Leigh Hunt, "I do not know whether my first sensation was admiration of its extreme beauty or astonishment at its posture." But the ideal traveler will tarry long enough to get the posture out of his mind and dwell on the beauty alone. A campanile 179 feet high, it is 14 feet out of perpendicular. Did the architect build it at that angle or did the foundation slip? Long have been the disputes on that subject, but since there are no contemporary documents in proof, the student must form his own conclusions. The author adds a word of common sense to the argument. "The aim of Italian art was simple and direct; it nowhere reveals a crooked notion; of its very nature it abhors a freak. Its present posture jars with its sense of beauty. But if it did not lean, it would be merely an exquisite white marble tower,—not one of the wonders of the world."

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THE EDITOR'S FORUM

TREND OF COUNTRY HOUSE DESIGN

By PARKER MORSE HOOPER

AFTER a period of five years since THE ARCHITECTURAL FORUM published its first Reference Number on Country Houses, it is again its privilege to take up for consideration this type of architecture so close to the hearts of all architects. Although five years does not seem long in the passing and is only half a decade, it is surprising to note the changes which have taken place in country house design in these few years. So rapid is the speed at which this country is progressing and growing and developing, not only in commercial fields but also in literary and artistic spheres, that even in so short a space of time as five years, changes and improvement can be noted.

It seems appropriate to include in this Country House Reference Number a brief survey of what has happened in the field of domestic architecture. During the two years in which the United States was an actual participant in the World War, practically all the creative arts were at a standstill. Such houses as were built between the years of 1916 and 1920 were with few exceptions of no great size or importance. The red brick or white painted shingle and clapboard house in the Colonial style was the type most frequently built during the war period. The Spanish and Italian were still largely confined to southern California and Florida. Houses in the French farmhouse and small chateau styles were infrequently used as precedent. Houses following the Tudor and the later types of Elizabethan England were declining in popularity. Already ten years had elapsed since John Russell Pope built his masterpiece at Newport for Stuart Duncan. So when THE ARCHITECTURAL FORUM reviewed in its first Reference Number in 1923 the development of country house architecture during the five years previous, it was able to show little that was new, original or outstanding in this particular field of architecture. Today the situation is quite different. Five years of amazing national prosperity, such as no country in the world has ever experienced, has stimulated and made possible a real development in country house design. American architects have enjoyed opportunities of exercising their creative ability, good taste and architectural sense to a degree before unheard of. Great mansions have arisen in the country, at seaside resorts and in suburban districts which equal and even surpass in size, beauty and magnificence the best work of the past. It is only necessary to mention such great houses as have been built for Otto Kahn, Richard Crane, and Marshall Field and hundreds of other leaders in the social and financial circles of today. At no time in the entire history of civilization has the architectural profession experienced such a tremendous opportunity for designing and building great and outstanding examples of creative architecture. The members of the profession should appreciate the privilege of living in this age and of taking parts either large or small in this far-reaching development of American architecture. So great is this opportunity that it should stimulate as never before the creative instinct of the profession. In the field of American architecture today the country house leads not only in numerical, but also in popular importance. Examples of recently completed country houses in many different styles, scattered throughout the United States from coast to coast are shown in this issue of THE ARCHITECTURAL FORUM. From a general survey of these illustrations one will be immediately impressed by the variety and freedom in design which are evident. Houses indirectly derived or closely following Georgian and Colonial precedent are in a growing minority. Except for regional and climatic reasons, houses more or less influenced by Spanish and Italian precedent are declining in popularity. The work of the modern English architects, such as Baillie Scott, Guy Dawber and Sir Edwin Lutyens has considerably influenced the trend of American country house design in the past five years. Also greater familiarity with the cottage and farmhouse architecture of northwestern Europe has made possible the splendid work in these particular styles of many leading younger architects. Such names as Frank J. Forster, Lewis Bowman, Edmund B. Gilchrist, Robert R. McGoodwin and George Howe immediately call to mind delightful houses suggesting Normandy, Brittany, the Cotswolds and other rural districts of France and England. There are too few American architects today who have either the desire or the determination to do really individual and outstanding work, too few men who are neither passive followers of precedent nor clever copyists of current work. It is indeed a pity that we have not developed in this country more architects of ability, perfection of taste and individualism of style, such as Harrie T. Lindeberg and Edward Clarence Dean. The expenditure of no amount of time and thought and inspiration is too great, in the opinion of these men, to produce the subtle charm, artistic quality and original conception which characterize their work.

To what extent the modernists' expression, already evident in our modern commercial architecture and in many cases consistently and satisfactorily expressed, will influence the design of the future American country house, is a question. Domestic architecture cannot be separated from precedent.

THIS is one of the many interesting Russwin advertisements now appearing in colors and in black and white in the following publications:

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THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER THREE

SEPTEMBER 1928

THE COUNTRY HOUSE

BY
AYMAR EMBURY II, ARCHITECT

COMING only once in six years, publication of the Country House Reference Number of THE ARCHITECTURAL FORUM affords an opportunity for stock-taking, for a brief breathing space in the hurry of trying to design country houses, in which one may consider what has been accomplished, and in which one may examine the current trend in domestic architecture and may speculate as to what the future may hold. It is of course true that in so brief a period no marked difference will appear between the work of this year and that of six years ago, but at least one can discover whether one's opinion of five years ago was based upon a correct understanding of general tendencies, or whether it was the unconscious expression of a hope, perhaps reinforced by observation of some happy examples which were sprouts rather than true growths upon the tree of architecture.

Of one thing we may be sure,—that the general public understanding and appreciation of good architecture are growing by leaps and bounds. People are demanding today, as they have never consciously demanded in all the history of the world, beautiful buildings (or what they believe to be beautiful) for their offices, for their civic structures, and above all for their homes. So widespread is this demand that architects instead of leading their clients are in many cases led by them, and while this great mass of unformed and to some extent ignorant desire for beautiful things is in the long run sure to be of great public benefit, it is not only possible that it does occasional and temporary harm to the development of sound architecture, but it is from time to time evident that it actually does work in a harmful way. That this half educated mass of public interest and opinion in architecture is really of great numerical strength is evident by the astonishing circulation of the untechnical magazines which specialize in the field of home building and home making, and by the space which the general magazines of enormous circulation, such as for example *The Saturday Evening Post* and the *Delineator,* give to articles about house building, garden planning and interior decoration. Why, they have even begun to make the collecting of antiques a popular hobby!

As has already been said, this enormous general interest in dwelling houses will in the end have an excellent effect. It must always be borne in mind that the appearance of our towns and cities is dependent not upon the few fine buildings they possess, but upon the average of all of them; and we shall never again have in the United States, towns, cities, and villages of such lovely and unspoiled beauty and perfect consistency as those of colonial times, until the average of all our houses is as good as the average was then. It is doubtful if such a time will ever come, but at least we are tending toward an approximation to it; for one good country house of 30 years ago there are a thousand today, and for one layman who was then really appreciative of good design, there are five thousand today. It was not that three decades ago our architects were incapable of good design, but rather that the public taste was so unformed that the good house passed unrecognized. It is over 30 years ago that McKim, Mead & White built the Breese house at Southampton; in 1903 Charles Barton Keen built the Chauncey Olcott house at Saratoga, and in 1897 Cope & Stewardson were the architects of the Fine house at Princeton; and to those who remember these three lovely houses and compare them with the best of the current work, it will seem that domestic architecture has not advanced a great deal; none of the recent houses of Colonial precedent shows more complete understanding of the principles of Colonial design and a finer hand in their adaptation to modern needs than the Breese house; the Olcott house might, had it not already become almost the foundation of a country house school, have been an example from which one could demonstrate how a new architecture may be developed from old precedent; and of all our careful current copies of seventeenth century English country houses, none has expressed the spirit of that delightful time more beautifully and more simply than the Fine house. It is obvious that it is to the mass of work and not to the exception that we look for progress,—and there we find it.

In certain ways, a survey of the field is discouraging; there is in American architecture as a whole, and especially in domestic work, a great deal of "know how," but an almost total absence of what, for want of a better word, may be described as "inspiration." It is of course an arguable point as to

House of James L. Breese, Esq., Southampton, N. Y.
Built in 1898 by McKim, Mead & White, Architects

whether there is in architecture any such thing as inspiration; there may be or there may not be, but there is certainly far too much downright copying. To take an example of the domestic field, York & Sawyer, apparently tired of the endless repetition of four engaged columns which they and their imitators have taught the public spell BANK, designed by what seems a genuine effort of the imagination and consummate genius that extraordinarily interesting and beautiful Bowery Savings Bank; and behold!—as if fertilized by a magician's wand, the land sprouts bastards thereof from coast to coast. And one could not complain if these conscious imitations of a fine piece of architecture showed any knowledge or appreciation of design as an expression of structure; on the contrary, the principal motif, the deep arched portal, as well as the Romanesque detail, and even the yellow stone, are plastered against facades where they have little meaning; and even when the copies are as accurate as good photographs, measured drawings and excellent modelers can make them, they still are second rate.

Truly, "the letter killeth, but the spirit giveth life." So in our country houses, every little new trick in design, every little charming detail, every tendency toward growth produces a host of debauched imitations; and every new book that contains work of real quality, be it French, Spanish, English or Colonial, brings a new crop of country houses, often the frankest copies of picturesque exteriors, with plans tortured into shapes which by some effort will permit some faint, far-away agreement with these exteriors. For this architects are primarily to blame; we should know how to use our books as mines in which to delve for inspiration, but not as sources of models to copy, a thing of which we are likely to be guilty.

On the other hand, the poor devil of an architect has often been put into a miserably unhappy position by the very magazines which have done so much to help him. The public has been taught to demand labels on everything, and people have also been taught to distinguish pretty accurately between the various sorts of labels, and to demand only the genuine. It is very nearly impossible to design for the average American woman just a "house." It must be "true Colonial," or "Mediterranean" (a terrible word), or in some other style which has been stamped with the approval of the editor of *House & Garden* or of *The House Beautiful* before the architect is permitted to build it. The really cultivated client not only requires a general type but a particular sub-species thereof, as for example a "XVI century Cotswold cottage," or an "early XIX century Pennsylvania farmhouse." Very often the clients' desires result in charming examples of domestic architecture, but more often the badgered architect pulls out, or buys, or borrows a book on a style about which he knows nothing and for which he has no sympathy, and falls to copying. Under these circumstances an art can hardly be advanced very steadily in any given direction; it is driven to diverse quarters by contrary and baffling winds of fashion which change so frequently that no architect can keep up with them. To design in the spirit of any style, even of so simple a style as our own Colonial, requires a deep and genuine knowledge of an archæological kind, plus an ability, the style once learned, to forget its results and only remember its processes. Better, far better, to begin with a plan and on that plan to erect walls high enough to provide head room, with windows that

House of Henry B. Fine, Esq., Princeton, N. J.
Built in 1897 by Cope & Stewardson, Architects

give light and air, decorated with any traditional motifs that fit the mass, and call it a "house," rather than to start with a formula, and try to compress within its limitations a mode of living.

Partly, of course, the varying fashions are due to the enormous number of houses that are being erected, and to the fact that in many cases they are the result of mass production. Lovely as we may think the old colonial towns like Stonington or Milford, and much as we may regret the fact that our modern real estate "developments" lack the charm of these old villages, it is obvious that if the twenty thousand little houses built during the last ten years between the edge of Brooklyn and the beginning of Jamaica had all of Colonial precedent, the dreary monotony of these square miles of small white boxes set on a treeless plain would have been at least as depressing as the featureless varieties of ugliness which have actually been built. Mass production may be economically necessary, but too constant repetition of any architectural motif, no matter how good, becomes a weariness to the flesh. The University of Virginia depends for its exquisite loveliness upon the classic column; but the effect of its repetition upon the student body is shown by the fact that the young initiate into its architectural society is required to count them and name the orders; there are 2284 columns (not orders) without counting pilasters!

If, therefore, we cannot repeat motifs constantly, and preserve in them any freshness, we must change the motif. So far in this country we have acquired a sort of false vitality by seeking out unused sources of precedent. We have had our Colonial revival, our English farmhouse spasm, our "Mediterranean" obsession, and may be said to be fairly in the throes of the "minor French *manoir*" period. In Europe they have tried all these things in the past, and are sick to death of them; hence the determined and largely unfruitful effort to create a new architectural style, the so-called "modernist" movement. One must admire the attitude of mind that has the courage to determine to be bound by no tradition, without being able to sympathize with the attempt to throw away the accumulated knowledge of thousands of years; nor does one seem to be the necessary concomitant of the other. Just as Charles Barton Keen, 30 years ago, produced a logical, beautiful, and entirely novel type of country house, by a new and skillful (I had almost said inspired) combination of old motifs, so it would seem today that the determination to break loose from tradition does not imply the discarding of all traditional forms of ornament. With the announced principles of the European (and American) architects practicing in the new school, one cannot quarrel. It is axiomatic that a building should be expressive of its purpose; that ornament should be derived from the spirit of the times; that there should be no sham, no striving for effect for the sake of effect. But these are not new principles; they have been taught at the Ecole des Beaux Arts for a century, and Asher Benjamin wrote them in the early days of our republic in one of his humble handbooks for the country builder. But when the results obtained by the new school are compared with those obtained by the old, we find that architects will be architects, and that the new, like the old, are utterly unable to forget that a picturesque mass is a pleasing thing, whether it be reducible to essentials or not. To take an oftquoted sample, compare the Pennsylvania Station in New York with the Central Station

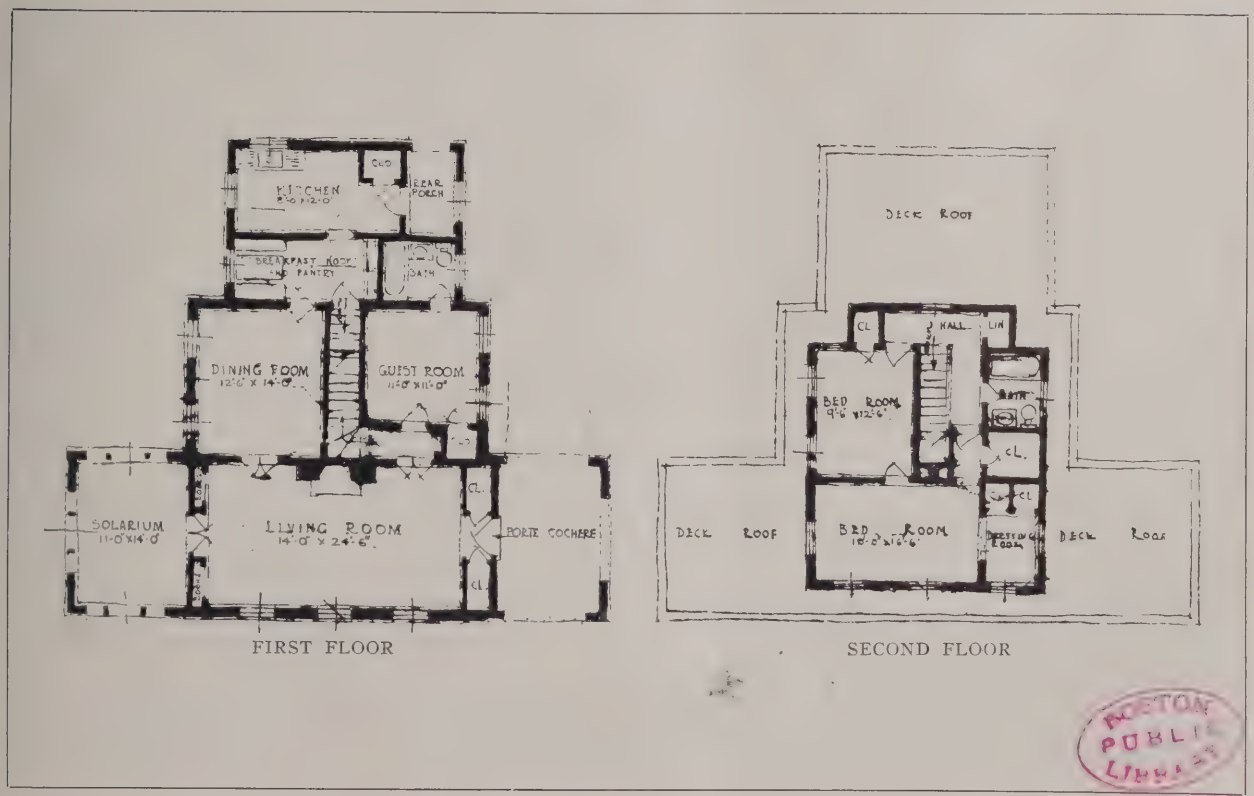
The House of Chauncey Olcott, Esq.
Built in 1903 at Saratoga, N. Y., by James Barton Keen, Architect

Helsingfors, Finland, designed by that brilliant architect, Saarinen. The protagonists of the new school abhor the Doric colonnade of the Pennsylvania as unnecessary and therefore ridiculous, while in the Helsingfors station they fail to see any anachronism in the tower, presumably for the signals on an underground railroad.

Yet if these apostles of the new have produced little that is of intrinsic value and enduring worth, they have at least pointed to the way out of our present unhappy dilemma. It is true, that with the exception of certain houses by Frank Lloyd Wright, to which the hide-bound conservative must render somewhat grudging praise for their power and sheer creative ability, there are no country houses in the new school here or in Europe which thrill us by their loveliness as do many of the older works both of Europe and our own colonial times, or even as do many of our modern houses founded upon and closely following well known precedents. Yet it is perhaps much due to the fact that these new houses err in the same way as the older buildings, in the desire of their designers to achieve certain results rather than to let these results grow naturally from expression of plan and the normal needs of life. Our materials and our ways of life are changing; our design will change with them unless it is consciously held within narrow and specified channels by preconceived notions of architectural dress. Take, for example, so simple a thing as steel casement sash. Here is an article developed to fill the need of a commercial product which would be consistent and in keeping with our copies of the English country house, and we find it economical, convenient, and rational. Today use is being made of these casements in houses derived from all sorts of precedents, and since fenestration is, next to mass, the most important element in country house design, a profound change automatically takes place. If the designer has a plan which naturally brings to mind the simple, square, box-like Colonial house, and has the skill to adapt to this mass the fenestration required by the steel sash of stock design, he produces not a bastard but a hybrid product; and if the hybrid has a real flavor of its own, he has by so much advanced the design of country houses, and will not be without copyists and imitators. And in that lies the saving grace of our architecture today (that evidently we know what to copy), even though done in too great haste, often without thought, often straight copying. No longer are the bad old precedents regarded as of equal value with the good. We have learned to know good architecture when we see it,—architects and public alike,—and the day may be not far distant when we may be able to do, on the average, really good architecture ourselves!

Very truly and heartily do I include myself among the vast number of architects, who today, due to the high tension under which we live and the terrific speed at which we are forced to work, have little time or incentive to secure ideas and inspiration from the careful study of precedent either old or new. We are all too likely to work along the lines of least resistance, to follow the accepted styles and tastes of the clients whom we serve. In case by chance any of the readers of The Architectural Forum should really have time or opportunity and should read this article with the rather iconoclastic opinions set forth, I wish to make it clear that I take full responsibility for the various opinions expressed.

FRONT ELEVATION



FIRST FLOOR

SECOND FLOOR

A HOUSE IN THE MODERN STYLE, BUILT IN 1927 AT AMARILLO, TEX.

FRANCIS KEALLY, ARCHITECT

ENTRANCE FRONT

A HOUSE IN THE FRENCH STYLE, BUILT IN 1927 AT GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

Photo. S. H. Gottscho

A HOUSE IN THE ENGLISH STYLE, BUILT IN 1926 AT SAUGERTIES, N. Y.
BUTLER & CORSE, ARCHITECTS

HOUSE OF J. LEVY, ESQ., NEW ORLEANS

Photos. Tebbs & Knell, Inc.

HOUSE OF A. M. WEST, ESQ., NEW ORLEANS

TWO HOUSES BUILT IN THE SOUTH IN 1926

MOISE GOLDSTEIN, ARCHITECT

GARDEN FRONT

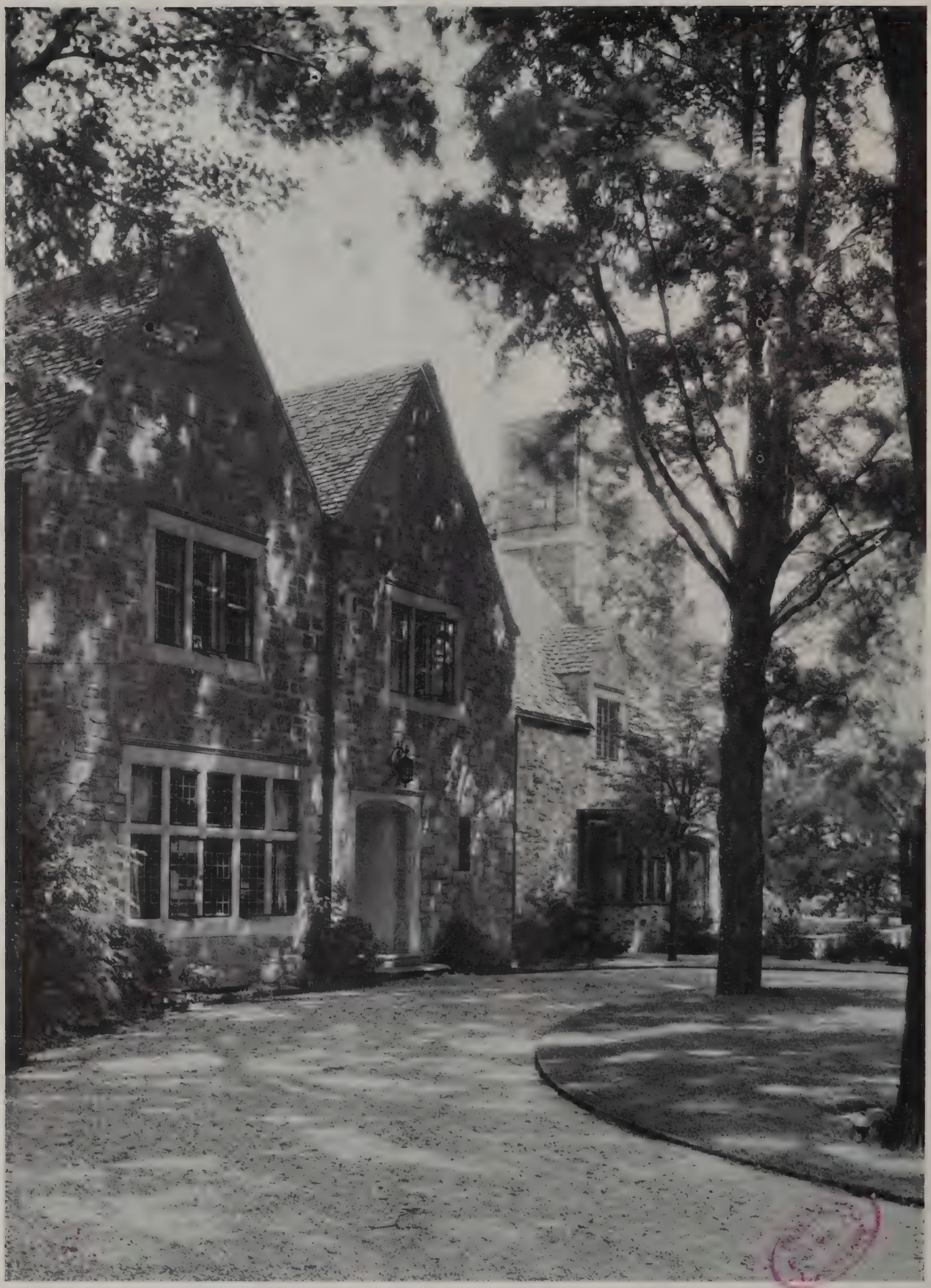
Photos. John Wallace Gillies, Inc.

Plans on Page 320

ENTRANCE FRONT

HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT



MAIN ENTRANCE
HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

SERVICE AND GARAGE ENTRANCES
HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

GARDEN ENTRANCE TO MAIN HALL
HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

DETAIL OF DINING ROOM BAY AND GARDEN FRONT
HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

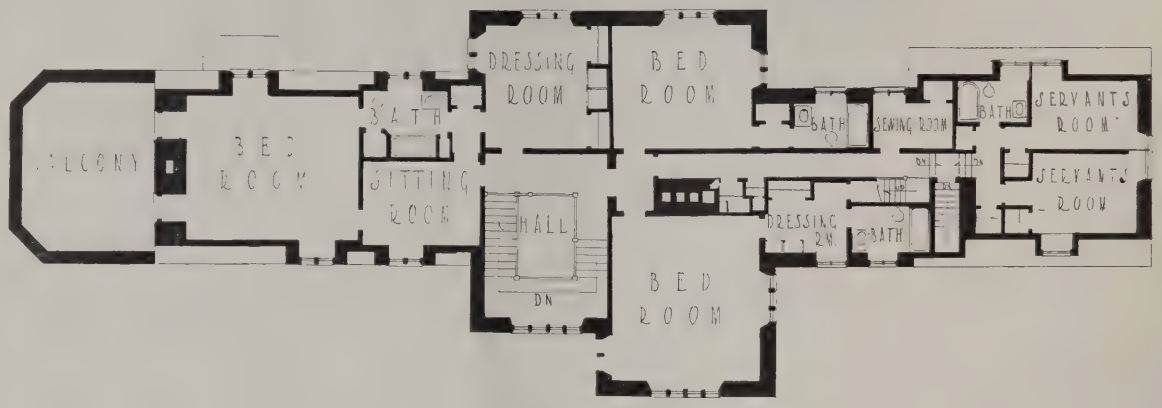
STAIRWAY AND GARDEN DOOR
HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

LIVING ROOM

LIBRARY

HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT



SECOND FLOOR

FIRST FLOOR

PLANS: HOUSE OF C. T. WEIHMAN, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT

Photo. Tebbs & Knell, Inc. *Plans on Back*

HOUSE OF A. M. WEST, ESQ., NEW ORLEANS
MOISE H. GOLDSTEIN, ARCHITECT

CONSTRUCTION DATA

General Type of Construction: Masonry and frame.

Exterior Materials: Hollow terra cotta tile, stuccoed.

Roof: Iron-flashed brown English tile.

Floors: Oak.

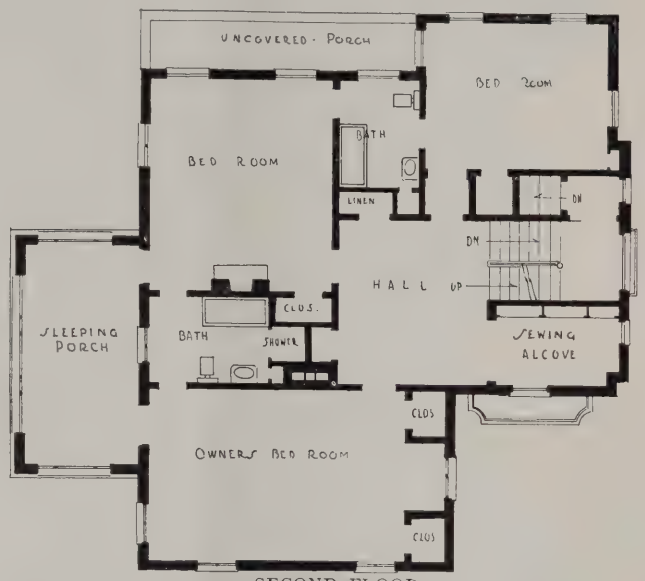
Heating: Warm air.

Interior Woodwork: Cypress.

Interior Wall Finish: Plastered and painted.

Interior Decorative Treatment: Caen stone and painted plaster.

Approximate Cubic Footage: 62,200, including attic and basement.



SECOND FLOOR

FIRST FLOOR

PLANS: HOUSE OF A. M. WEST, ESQ., NEW ORLEANS
MOISE H. GOLDSTEIN, ARCHITECT

GARDEN FRONT

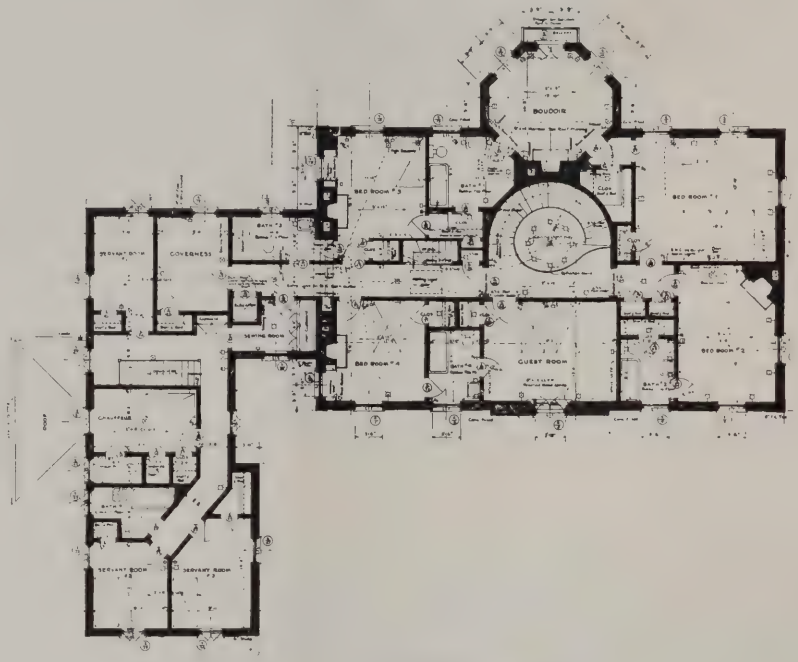
Photos. Mattie Edwards Hewitt *Plans on Back*

HOUSE OF NORMAN MACKIE, ESQ., PRINCETON, N. J.

MARION SIMS WYETH AND FREDERICK RHINELANDER KING, ASSOCIATED, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: June, 1927
General Type of Construction: Brick and tile.
Exterior Materials: Brick and limestone.
Roof: Slate.
Floors: Marble and oak.
Heating: Oil.
Interior Woodwork: Pine.
Interior Wall Finish: Plaster.
Interior Decorative Treatment: Georgian.
Approximate Cubic Footage: 100,000.
Total Cost, $87,940.



SECOND FLOOR

FIRST FLOOR

PLANS: HOUSE OF NORMAN MACKIE, ESQ., PRINCETON, N. J.
MARION SIMS WYETH AND FREDERICK RHINELANDER KING, ASSOCIATED, ARCHITECTS

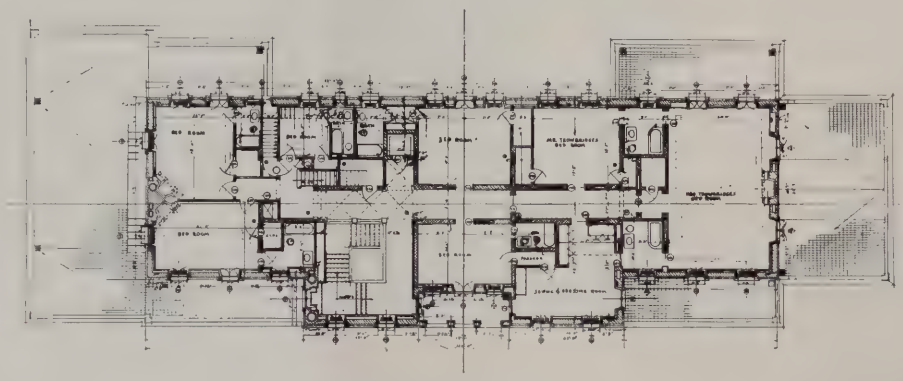
Photos. Kenneth Clark *Plans on Back*

HOUSE OF JAMES A. TROWBRIDGE, ESQ., NOROTON, CONN.

ELECTUS D. LITCHFIELD, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: November 3, 1924.
General Type of Construction: Fireproof throughout.
Exterior Materials: Pink marble.
Roof: Tile.
Floors: Black terrazzo, granite and composition.
Heating: Indirect steam.
Interior Woodwork: Birch.
Interior Wall Finish: Sand-finished plaster.
Interior Decorative Treatment: Decorative ceilings and doors.
Approximate Cubic Footage: 354,479.
Total Cost: $482,482.16.



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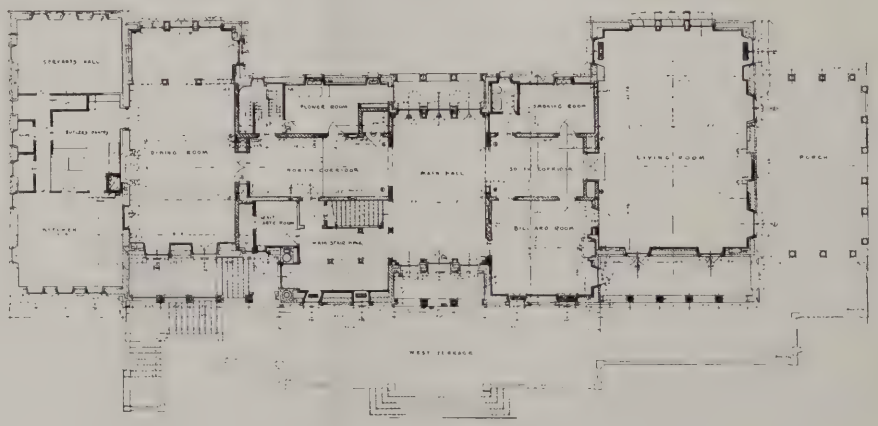


FIRST FLOOR

PLANS: HOUSE OF JAMES A. TROWBRIDGE, ESQ., NOROTON, CONN.
ELECTUS D. LITCHFIELD, ARCHITECT

INTERIORS: HOUSE OF JAMES A. TROWBRIDGE, ESQ., NOROTON, CONN.
ELECTUS D. LITCHFIELD, ARCHITECT

PUBLIC LIBRARY

Plan on Back

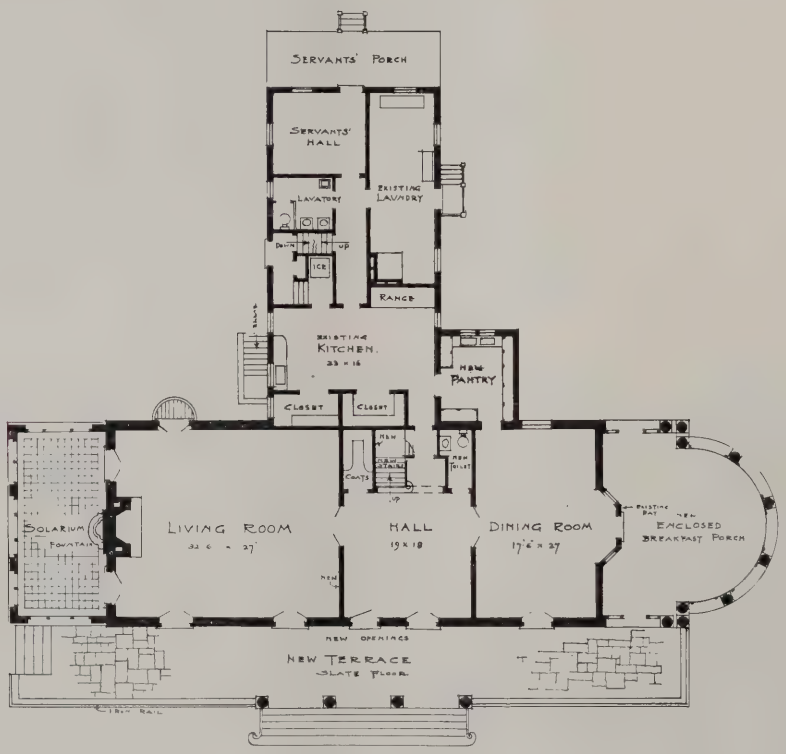
Photos. Amemya

HOUSE OF J. N. MILLER, ESQ., GLEN COVE, N. Y.

BRADLEY DELEHANTY, ARCHITECT

CONSTRUCTION DATA

General Type of Construction: Brick and wood.
Exterior Material: Brick (common).
Roof: Slate.
Floors: Oak.
Heating: Hot water.
Interior Woodwork: White pine.
Interior Wall Finish: Plaster and pine.
Interior Decorative Treatment: Painted; living room paneled in white pine.



FIRST FLOOR

PLAN: HOUSE OF J. N. MILLER, ESQ., GLEN COVE, N. Y.
BRADLEY DELEHANTY, ARCHITECT

LIVING ROOM

DINING ROOM

HOUSE OF J. N. MILLER, ESQ., GLEN COVE, N. Y.

BRADLEY DELEHANTY, ARCHITECT

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GARDEN FRONT

Photos. F. E. Geisler *Plans on Back*

HOUSE OF WALTER BARRET, ESQ., SOUTH TAMPA, FLA.
DWIGHT JAMES BAUM, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
General Type of Construction: 8-inch brick walls, main portion; wings, frame.
Exterior Material: Brick, painted with white cement coating. Other walls of Southern cypress.
Roof: Variegated colored slate.
Floors: Oak and tile.
Interior Woodwork: Whitewood, painted and enameled.
Interior Wall Finish: Walls painted and glazed in oil; some rooms papered.
Approximate Cubic Footage: 48,000.
Total Cost: $30,000.

PLANS: HOUSE OF WALTER BARRET, ESQ., SOUTH TAMPA, FLA.
DWIGHT JAMES BAUM, ARCHITECT

GARDEN FRONT

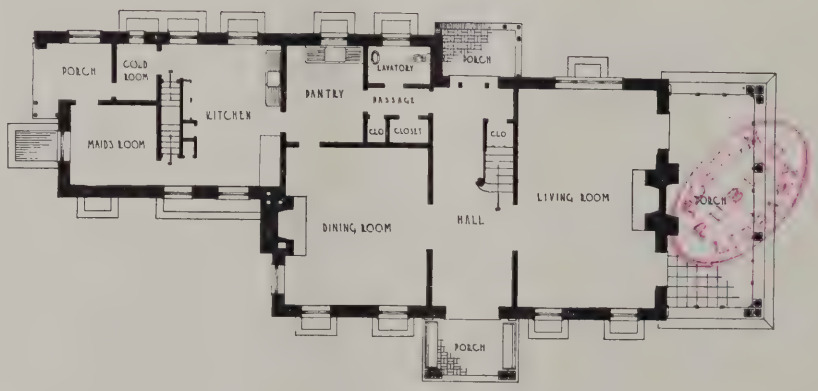
Plans on Back

HOUSE OF MRS. JAMES HASTINGS, ALTOONA, PA.
CARL A. ZIEGLER, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1923.
General Type of Construction: Stone walls; wooden joists and floors.
Exterior Materials: Local stone laid random; rubble.
Roof: Split cypress shingles.
Floors: Quartered white oak.
Heating: Hot water.
Interior Woodwork: White pine, painted.
Interior Wall Finish: Wallpaper.
Cost: 40 cents per cubic foot.

SECOND FLOOR



FIRST FLOOR

PLANS: HOUSE OF MRS. JAMES HASTINGS, ALTOONA, PA.
CARL A. ZIEGLER, ARCHITECT

ENTRANCE FRONT

Photos. Tebbs & Knell, Inc.

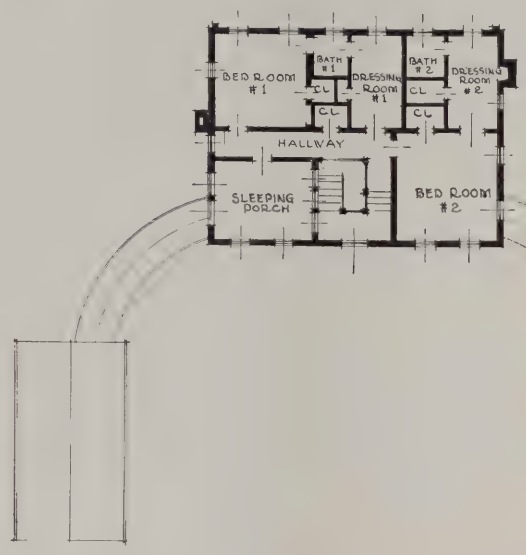
Plans on Back

HOUSE OF W. L. CLAYTON, ESQ., HOUSTON, TEX.

BIRDSALL P. BRISCOE, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1924.
General Type of Construction: Frame.
Exterior Materials: Clapboards and painted brick.
Roof: Shingles.
Floors: Oak; tile; pine.
Heating: Hot water.
Interior Woodwork: Pine, enameled.
Interior Wall Finish: Wallpaper.
Interior Decorative Treatment: Simple Georgian.
Total Cost: House, garage and pool, about $45,000.



SECOND FLOOR

FIRST FLOOR

PLANS: HOUSE OF W. L. CLAYTON, ESQ., HOUSTON, TEX.
BIRDSALL P. BRISCOE, ARCHITECT

GARDEN FRONT

Photos. Charles Trefts

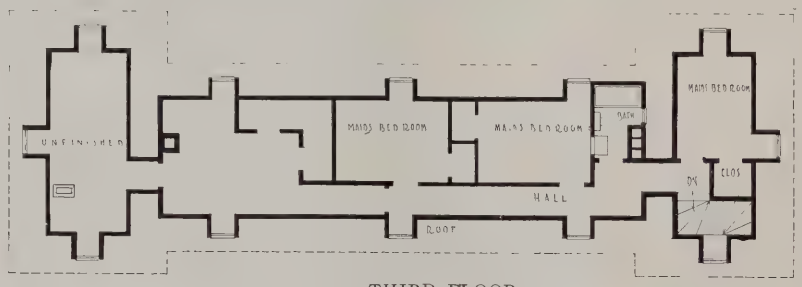
Plans on Back

HOUSE OF VIRGIL A. LEWIS, ESQ., ST. LOUIS

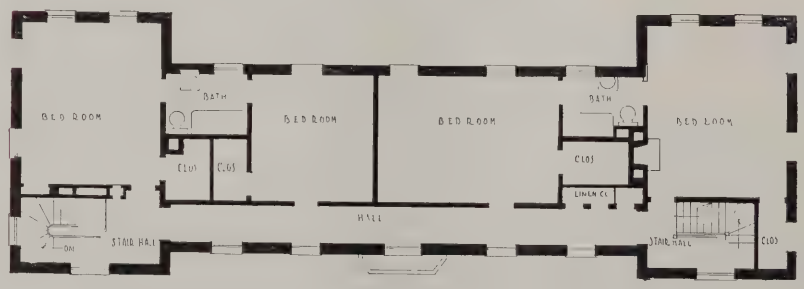
BEVERLEY T. NELSON, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1927.
General Type of Construction: Fireproof masonry.
Exterior Materials: Stucco with stone trim.
Roof: Slate.
Floors: Reinforced concrete and gypsum, covered with marble. Parquet, walnut and oak flooring.
Heating: Vapor system; oil burner.
Interior Wall Finish: Hall, composition Caen stone. Living room, canvas painted. Sitting room, canvas papered. Dining room, plaster. Second floor bedrooms, papered.
Approximate Cubic Footage: 66,239.
Total Cost: $70,000.



THIRD FLOOR



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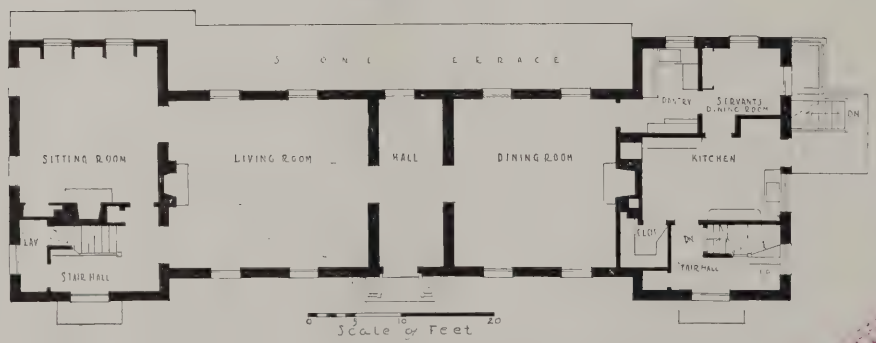


FIRST FLOOR

PLANS: HOUSE OF VIRGIL A. LEWIS, ESQ., ST. LOUIS
BEVERLEY T. NELSON, ARCHITECT

Photos. Tebbs & Knell, Inc.

Plans on Back

HOUSE OF C. L. DINKLER, ESQ., ATLANTA

OWEN J. SOUTHWELL, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: September 15, 1928.
General Type of Construction: Masonry walls; wood stud and metal lath partitions, wood floor and roof framing, except basement and garage.
Exterior Materials: Stucco on concrete tile.
Roof: Fading green slate.
Floors: Oak, stained walnut.
Heating: Blast system indirect steam.
Interior Woodwork: White pine painted, except library, which is poplar stained.
Interior Wall Finish: Hard-finished plaster, painted and papered.
Interior Decorative Treatment: Ornamental plaster cornices and ceilings; pilasters in living room, with wood dado; papered panels. Dining room, papered walls; ornamental cornice and base. Library, poplar stained brown, marble mantel. "Powder room," hand-blocked linen wall panels. All baths tiled to ceiling, one in sea green and turquoise.
Approximate Cubic Footage: 47,600.
Total Cost: $45,696, including drives and architect's fees.

PLANS: HOUSE OF C. L. DINKLER, ESQ., ATLANTA
OWEN J. SOUTHWELL, ARCHITECT

HOUSE OF C. L. DINKLER, ESQ., ATLANTA
OWEN J. SOUTHWELL, ARCHITECT

ENTRANCE FRONT

Photos. Charles Trefts

Plans on Back

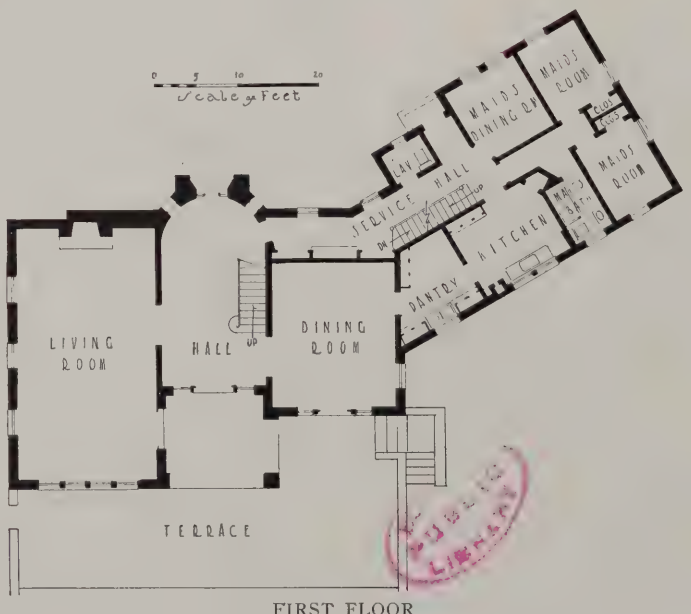
HOUSE OF GUY W. OLIVER, ESQ., ST. LOUIS

WILBUR T. TRUEBLOOD AND HUGO K. GRAF, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1924.
General Type of Construction: Brick walls; wood joists.
Exterior Materials: Brick facing, backed with heavy duty clay tile.
Roof: Wood shingles.
Floors: Oak.
Heating: Vapor or modified steam; oil burner.
Interior Woodwork: Oak.
Interior Wall Finish: Plaster; oak paneling in living room.
Approximate Cubic Footage: 68,000.
Total Cost: $24,000.

SECOND FLOOR



FIRST FLOOR

PLANS: HOUSE OF GUY W. OLIVER, ESQ., ST. LOUIS
WILBUR T. TRUEBLOOD AND HUGO K. GRAF, ARCHITECTS

GARDEN FRONT

HOUSE OF E. E. CRANE, ESQ., INDIANAPOLIS
GEORGE & ZIMMERMAN, ARCHITECTS

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ENTRANCE AND TERRACE

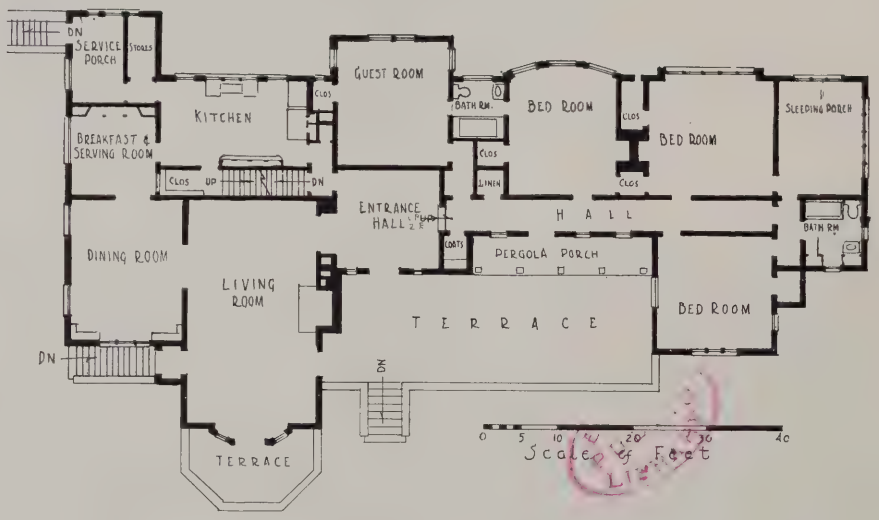
Photos. Tebbs & Knell, Inc. *Plan on Back*

HOUSE OF THOMAS H. BENNERS, ESQ., BIRMINGHAM, ALA.

WARREN, KNIGHT & DAVIS, ARCHITECTS

CONSTRUCTION DATA

General Type of Construction: Frame.
Exterior Materials: Brick veneer; stone trim.
Roof: Slate.
Floors: Oak, slate, linoleum, rubber tile.
Heating: Vapor steam.
Interior Woodwork: Oak and pine.
Interior Wall Finish: Canvas; wood paneling of oak.



MAIN FLOOR

PLAN: HOUSE OF THOMAS H. BENNERS, ESQ., BIRMINGHAM, ALA.
WARREN, KNIGHT & DAVIS, ARCHITECTS

ENTRANCE FRONT

Photos. Tebbs & Knell, Inc.

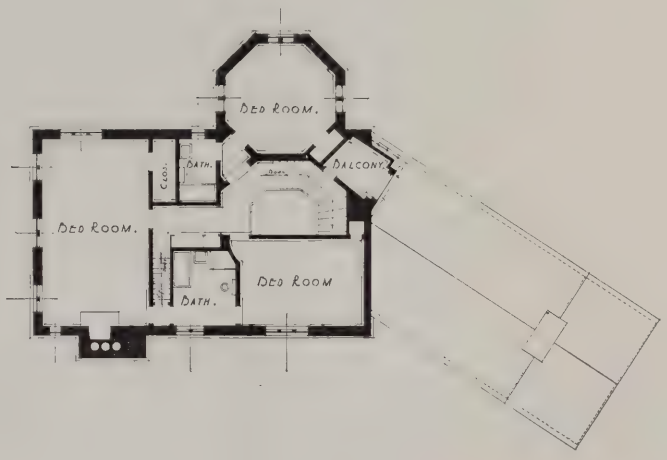
Plans on Back

HOUSE OF EARL WORSHAM, ESQ., KNOXVILLE, TENN.

BARBER & McMURRAY, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
General Type of Construction: Masonry.
Exterior Material: Field stone; brick; cast-stone trim.
Heating: Vacuum vapor.
Total Cost: $40,000.



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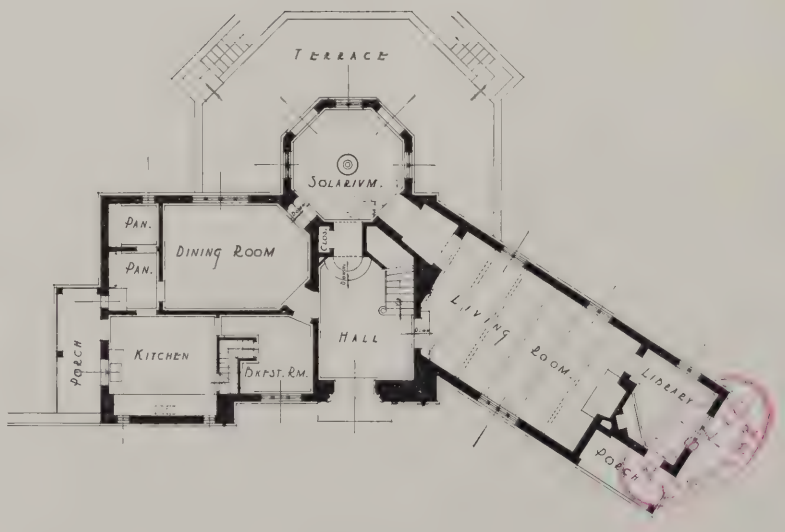

FIRST FLOOR

PLANS: HOUSE OF EARL WORSHAM, ESQ., KNOXVILLE, TENN.
BARBER & McMURRAY, ARCHITECTS

THE AMERICAN COUNTRY HOUSE IN THE FRENCH PROVINCIAL STYLE

BY
LEIGH FRENCH, JR.

EVERY year more and more American country houses are being designed and built for which some type of provincial French house has unmistakably supplied the initial source of inspiration. This patterning of American country houses after French regional prototypes has not only become a widespread practice, but there is also every indication that it will increase. As an accomplished fact, this practice is either justifiable or not justifiable. It is either desirable to adapt the building styles of different parts of provincial France to the requirements of American clients and environment, or else it is not defensible. There are those who stoutly maintain that the practice is inconsistent, and there are others who just as vigorously take up the cudgels to defend Gallic adaptations and champion every move to derive and apply inspiration from the domestic architecture of Normandy or Picardy, of Touraine or Burgundy, or of any of the other parts of France where the local modes of building in the past offer qualities and characteristics that seem convertible to good purpose in the plan and design and furnishing of the American country house of today.

The opponents of using French adaptations are of two sorts,—first, those who object on the ground that basing adaptations on acknowledged models of any kind tends to stifle originality and inclination to an individual quality of utterance; and, second, the rigid traditionalists who insist that the only legitimate style for an American country house must be based on some phase of the "American tradition," which they usually describe under the loose and misleading blanket term, "Colonial." The former anti-archæological camp would take away from the architect legitimate food for his imagination to work upon, sterilize his inventive faculties before beginning a project, so that no contaminating germs of recollected style may vitiate his work, and then, from an arid outlook, divested of all the natural accumulations of an active and well stored mind, set him to evolving from his own inner consciousness a design to clothe with a three-dimensional structure the plan indicated by the bald, utilitarian requirements of the occasion. Their attitude is not unlike that of some of the ultra-modernists who take as an insult any intimation that their work exhibits the least trace of precedent, though the precedent may come from nothing nearer than the remotest antiquity; their policy puts a premium on ignorance, nullifies the value of architectural education, requires of the architect merely ability to handle instruments and draft with reasonable decency, and would turn him

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Proposed House for Douglas M. Bomeisler, Esq., Greenwich, Conn.
From a Pencil Sketch by Leigh French, Jr., Architect

House for John R. Munn, Esq., Princeton, N. J.
From a Pencil Sketch by Leigh French, Jr., Architect

loose to design with the mental equipment of a child.

The "American tradition" protagonists usually ignore the fact that within the compass of the original thirteen colonies there were in use five or six distinct types of *real* Colonial expression, evolved from widely different inherited modes, which the settlers had brought across the Atlantic with them and which they tried to perpetuate unchanged as far as they could. Besides these diverse Colonial modes, there was the Georgian manner, which was Georgian pure and simple, and in neither character nor origin to be confounded with Colonial; it was deliberately imported from England in its entirety, and it reflected in America all the successive changes it experienced in England. True, restriction to a mode of style derived from some episode of the "American tradition" leaves considerable range of choice, but why should latitude of choice stop short with the so-called "American tradition"? The Colonial elements of the "American tradition" were themselves imported to American soil in the seventeenth century; before their importation they had a history of miscellaneous and partially exotic origins. The Georgian part of the "American tradition" came here intact from England; in England it was an imported exotic of Italian origin, with sundry contributions and additions from Dutch and French sources, and with further modifications and adaptations dictated by local needs and tastes at the hands of the English.

To my mind the whole situation in a nutshell is just this. The history of architecture is a record of the borrowing and assimilation of styles and modes of structure, continued without interruption since the dawn of civilization. Borrowing, experimentation and assimilation are the factors that have kept architecture fresh and vital, and that have made possible the process of healthy evolution. Nobody invented the Romanesque style; it was the result of evolution. Nobody invented the Gothic style; it, too, was the result of evolution. Furthermore, it is often possible to trace the very steps, with geographical and chronological accuracy, by which the evolution proceeded. The cathedral builders of the middle ages cribbed from one another, and there is enough documentary evidence to show that they did so and how they did it. The story of architecture and architectural style is a story of cribbing, either admitted or tacit. Cribbing, indeed, is and always has been a most useful ally to originality. Every style, as a matter of fact, is the product of cribbing and coördination in the light of local requirement. It is absurd, then, to take exception to the use of any French style on the ground that it is exotic or "foreign." The real test of its propriety in America is, first, whether it suits the conditions for which it is employed, and, second, whether the adaptation is well or badly done. This and nothing else is the test.

Hitherto various French provincial styles have proved suited to the needs for which they were used, and it is to the credit of the American domestic architect's acumen that he has been quick to grasp and turn to good account the opportunities offered. In other words, French domestic architecture of the provincial types afforded material of unusual sug-

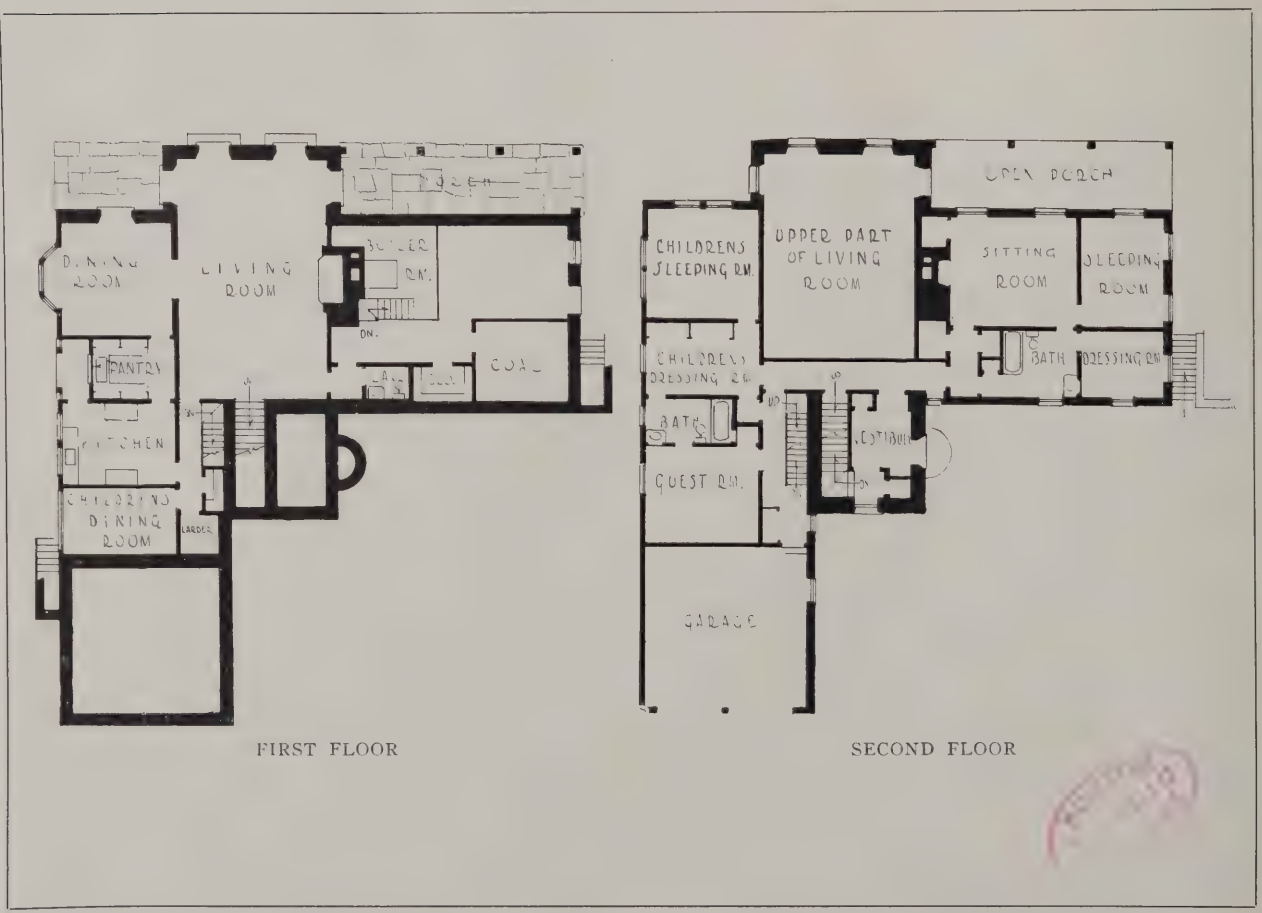
Design for a House in the French Style
From a Water Color Sketch by Leslie I. Nichols, Architect

gestive value. Why the types of French regional domestic architecture have fitted so well the wants of American country dwellers can be understood if we summarize the characteristics common to them all, irrespective of particular locality. In the first place, topographically and climatically the greater part of France is closely akin to America, and a manner of building that has approved itself in France is not likely, other things being equal, to present physical difficulties in America. There is none of the exotic flavor often incident to modes that have been adapted from countries whose climates are semi-tropical. Moreover, since climatic conditions, local materials and the general lay of the land,—three factors that inevitably affect architectural style,—exhibit numerous similarities to the same factors in America, there is bound to be much that we can consistently adapt to great advantage.

A second characteristic shown by country houses throughout provincial France is their privacy from the gaze of the passing world, a quality insistently required by their occupants. Though there may be wide divergences between the different modes of French domestic building, there are certain features that might be called *national* characteristics, which all of them almost invariably display. And not the least significant of these is that privacy which the Latin demands in his home. It may be secured in various ways, such as by building garden walls, by the arrangement of hedges and other planting, or perhaps by the choice and management of the site, but it is never absent. The French may have a racial preference for living in or near villages and small towns, rather than in the open country, but proximity of neighbors never minimizes their privacy, which they always take sufficient steps to preserve. For that reason this aspect of plan and design has a pertinent bearing, in view of the perceptibly growing inclination in America to keep outside surroundings at their proper distance; its importance increases measurably for those living in a more or less suburban neighborhood rather than in the complete seclusion of the deep country.

A third common characteristic is to be found in the coherence of plan that prevails in the arrangement of the house together with all of its dependencies so as to constitute a fully organized *group*. "All the subsidiary buildings, as well as the dwelling of the master, are considered as integral and essential parts of the total scheme, a scheme in which each part is looked upon as an individual unit. It would be futile to think of any one of these houses without taking into account at the same time the relation that each and every one of the dependencies, from the coach-house to the pig-sty, bears to it. In other words, we must regard the house as the chief unit of a *group*, a unit, however, that would lose most of its significance if we attempted to disassociate it from the other component parts of that group, no matter whether the group be composed of many units or of few." It is this well defined inter-relation of all the units that conveys the satisfying air of completeness so generally observable, even in establishments of very limited extent. The garden, of course, always

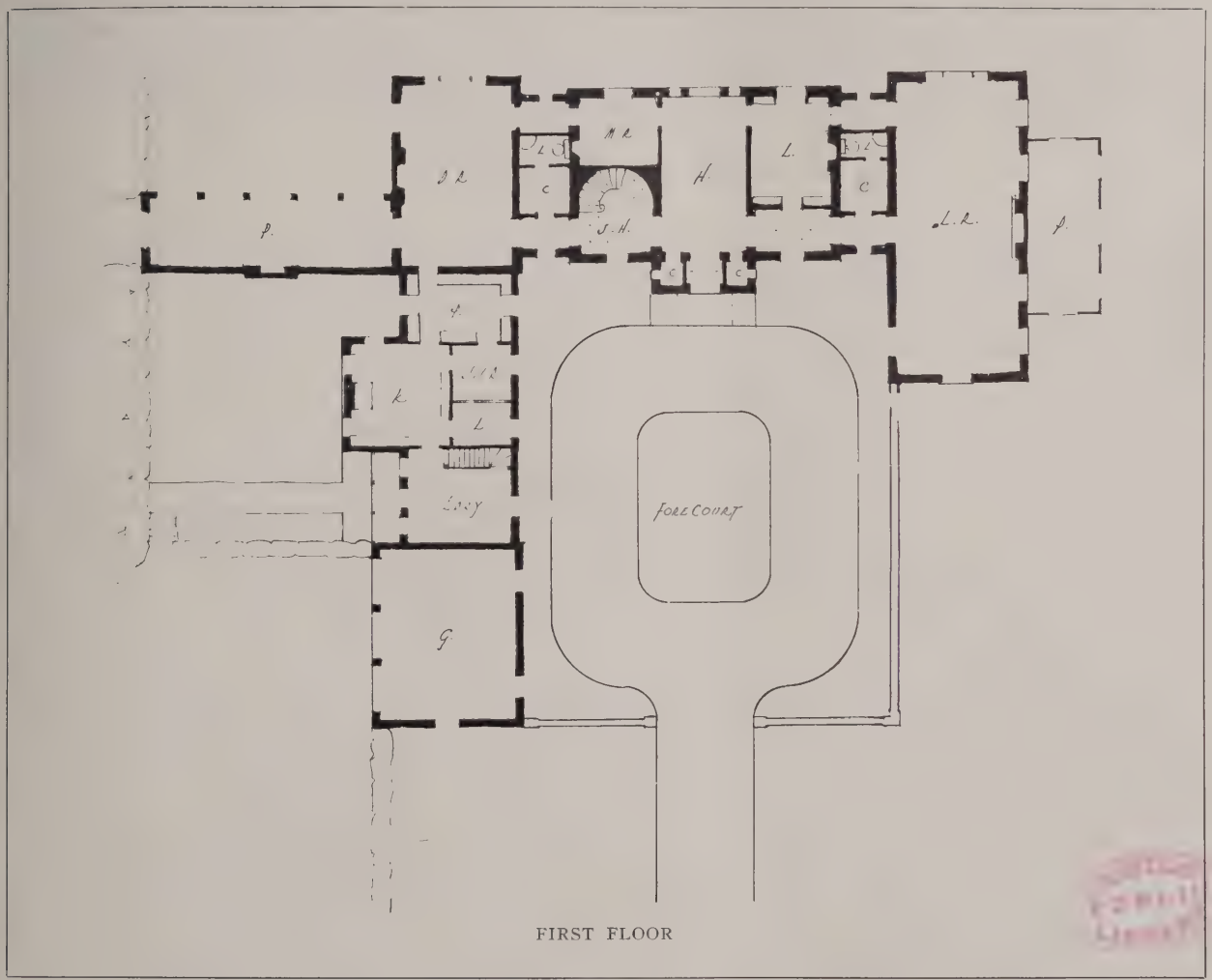
FRONT ELEVATION AND SECTION THROUGH GRADE



FIRST FLOOR SECOND FLOOR

PROPOSED HOUSE IN THE FRENCH STYLE AT POUND RIDGE, N. Y.
DONALD G. TARPLEY, ARCHITECT

FRONT ELEVATION AND SECTION THROUGH GRADE



FIRST FLOOR

PROPOSED HOUSE IN THE FRENCH STYLE AT CHESTNUT HILL, PA.
EDMUND B. GILCHRIST, ARCHITECT

See Plate 58

ENTRANCE FRONT, HOUSE OF VIRGIL A. LEWIS, ESQ., ST. LOUIS
BEVERLEY T. NELSON, ARCHITECT

FROM A PENCIL SKETCH, FRONT ELEVATION OF A FRENCH COUNTRY HOUSE
BREED, FULLER & DICK, ARCHITECTS

See Plate 58

GATE LODGE, HOUSE OF VIRGIL A. LEWIS, ESQ., ST. LOUIS
BEVERLEY T. NELSON, ARCHITECT

FROM A PENCIL SKETCH, REAR ELEVATION OF A FRENCH COUNTRY HOUSE
BREED, FULLER & DICK, ARCHITECTS

forms an inseparable and intimate part of the scheme.

A further characteristic of the French provincial house occurs really as a corollary to the practice of grouping just referred to. It is the *"intimacy of relationship in utilitarian functions"* that exists between the master's dwelling and all the subsidiary buildings on the place. Every structure in the group indicates a necessary connection of functions with the dwelling itself and the life of the people who occupy it. The poultry houses and the rabbitry are not only items in the group composition; they are also necessary and inevitable adjuncts to the house itself, for the poultry houses shelter what is destined for the use of the owner, either as a part of his direct food supply or as an immediately contributory to his profit, while the rabbitry ministers to domestic needs in exactly the same way. The master is vitally interested in the welfare of his sheep and swine, so why should not the sheepfold and pig-sties be where he can most readily see and care for them? All the farming operations, in short, are vital parts in the master's scheme of existence, so why should not the individual buildings that accommodate them have undisguised and visible representation in the group of which the master's own dwelling is the chief unit?

It was eminently logical that things should be so ordered. And the logic of the situation appealed to the practical-minded Frenchman. Without academic polish or sophistication, as most of the French provincial houses are, they possess in abundant measure an intensely human and domestic quality that strongly commends itself to American ideals of the country residence. The pictorial values so often exhibited in their composition are neither intentional nor calculated; they are attributable to straightforwardness and common sense in achieving the purpose intended in the most direct and logical manner. To their candid adaptation to individual needs and the special demands of environment, and likewise to their frank accommodation to utilitarian ends, can be traced a great measure of the fascination they invariably exert. Their directness in arriving at the purpose aimed at is thoroughly refreshing. And directness is the essence of style.

With the foregoing qualities of French provincial types in mind, we may examine the way in which American architects have approached the task of applying Gallic inspiration to the design of the American country house. It would be utterly futile and absurd to think of copying or reproducing exactly any given example of French regional architecture. Aside from the ridiculous affectation of such a performance, the result in most instances would be totally impracticable and not only look out of place but also be entirely unsuited to its purpose. The occupants would be nothing but the tenants of an unusual piece of stage setting and would find themselves constantly embarrassed in trying to act their parts becomingly. But very few such copies are perpetrated. In the main, the process of adaptation is carried out with good judgment and sincerity, and hence with no small degree of success, even when gauged by exacting standards established by taste.

A review of some of the work designed by a number of different architects, and now in course of construction, quite fully justifies the wisdom of deriving a body of style expression from French regional prototypes. It likewise demonstrates the ability of the American country house architect to invest his adaptations with a fresh vitality and to perform his task in a manner that is wholly original. What the architect has done in this field is exactly comparable to what the musician does when he takes an old motif or theme as the base of a musical composition and then builds up from it an altogether new symphony or concerto.

The plans, elevations and renderings here shown speak sufficiently for themselves to make any extended comment on the subject of their style unnecessary. Style, however, they all have;—style, that is, in its truest sense, the accomplishment of the end proposed in the most direct and the simplest manner, without affectations, whimsicalities or any fruitless turning aside for irrelevant incidents. All of them display certain preëminent characteristics that cannot fail to command approval and convey a sense of reassurance by the complete sanity with which every situation presented has been solved. There is nowhere to be found the least suggestion of that copyism which agonizes over the literal reproduction of non-essential "prettinesses,"—and generally gets them wrong,—while it overlooks fundamental principles. There is no trace of the cramping influence of being too archæological. If anyone obsessed with the passion for tagging and tabulating were to try to label them with arbitrary classifications, he would find that many of them he could scarcely assign to any one period or wholly to any one region. These houses, indeed, present a well digested composite drawn from a wide range of dates and places, so far as the bases of inspiration are concerned; in their ultimate manifestation, they are essentially modern, in the best sense, and thoroughly fitted to their purpose.

Like their French prototypes, they show no striving for effect; they derive their convincing interest from their plans, their just proportions, a sane and pleasant use of materials, and the simplicity, directness, genial dignity and serenity of their composition. The qualities displayed by country houses of this type augur well for the future of domestic architecture in America. The fresh tone infused by their presence is a valuable contribution toward the enrichment of the body of American architectural tradition, and it aids in maintaining the high standards of excellence that our architecture has achieved.

USE OF ENGLISH AND FRENCH TYPES FOR AMERICAN COUNTRY HOUSES

BY
FRANK J. FORSTER, ARCHITECT

OF all the types of architecture imported into this country, perhaps the English and French country house types have been the most successful. This is a logical and natural result, since our climate, except in the semi-tropical sections of the country, is quite similar to that of England and northern France, and our building materials are the same. The varied topography of the land furnishes sites for both the simply composed mass for a level site and for the more rugged, picturesque type of house suited to a rocky hillside. Racially and culturally we are more closely related to England and France than to any other European countries. For an understanding of these two types of houses, we should know something of their history. It is almost impossible to assign any definite dates for the development of the Norman country house in France, because this growth was so gradual and because there is very little documentary evidence concerning it. We can only guess, from the parallel development of the great churches, castles and public buildings which were the flower of the Gothic impulse, that the earliest beginnings of the Norman and Breton types of small houses go back as far, perhaps, as the ninth or tenth century. There are still many houses in France that are known to have been built as early as the fourteenth or fifteenth century. Even at that time the architecture had taken on definite characteristics of mass, uses of material and modes of construction which persisted down to the last century and were influenced only mildly by the Renaissance or any other upheaval in social and cultural life. The inherent stability of the country people precluded the possibility of their being influenced greatly by the Renaissance. Then, too, the cost of the elaborate over-ornamentation of the Renaissance was fortunately beyond their means. So today we find in the minor chateaux, the farm buildings and the peasant cottages of France a much truer representation of the Gothic than can be seen in many of the large and famous chateaux and public buildings. The castles and dwellings of the wealthy, the public buildings of the cities, and even some of the cathedrals are so be-daubed with Renaissance detail as to have lost much of their original Gothic character.

In England, the introduction of French ideas in architecture began of course with the Norman Conquest. Gradually the Saxon and the Norman types mingled, and the true English style was evolved. The English type differs from the Norman in that the roof pitch is not so steep, and cornices are heavier. Certain minor details in the English are perhaps not so graceful or romantic as in the Norman, but the two are similar in thought, in mode of construction and in materials employed, and in picturesqueness of mass. In my opinion, no other countries have developed architecture so vigorous and honest in idea and execution and at the same time so homelike and livable. The two styles, at their best, are a perfect representation of the taste

Photos. John Wallace Gillies, Inc.

A Garden Courtyard

An Entrance Approach

Brick and Stone Detail, House of Guiseppe Cosulich, Esq., Riverdale-on-Hudson, N. Y.
Frank J. Forster, Architect

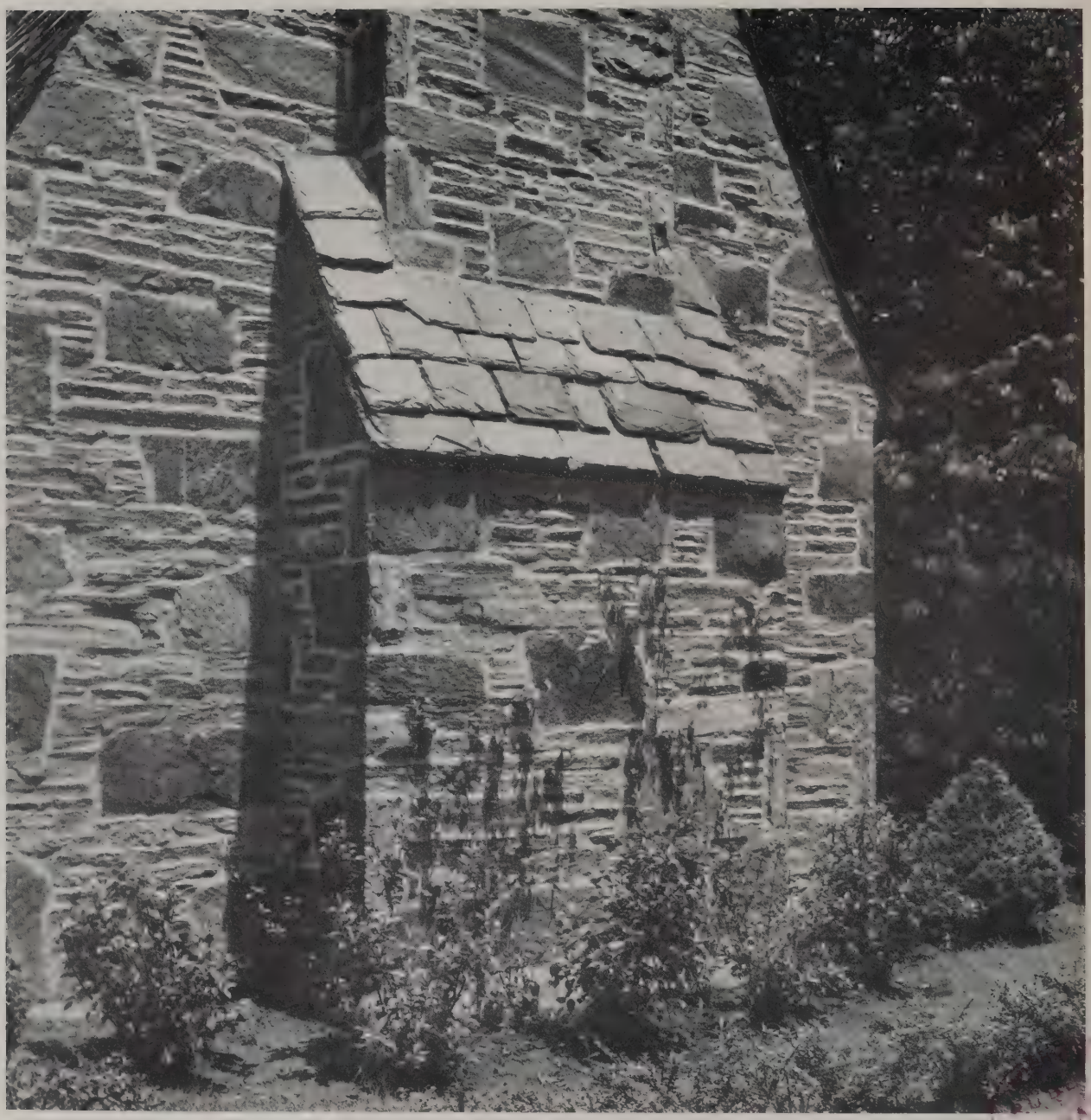
of two similar races of people, culturally sure of themselves and not readily changed by passing fashions in architecture. In England, much of the finest country house architecture can be found in the Cotswolds, and in the counties of Sussex, Kent and Suffolk. In France, the regions around Rouen in Normandy and Coutances in Brittany, yield some of the best examples of domestic architecture. Here it would be well to go into the differences of materials dependent upon the geology of the various localities. In regions where there is plenty of clay, brick and half-timber construction is the usual thing, with tile roofs. In the heavily wooded sections of England the timbers are placed close together, with the spaces between filled in with stucco on brick, and in traveling to more sparsely wooded regions one notes that the timbers are more widely spaced. Buildings entirely of wood are rare in England and almost unknown in France, but wherever wood is used, for half-timber, structural timbers, or for window and door frames, the wood is solid and sturdy; we find none of the flimsy, inch-thick veneer of wood so common in America. In regions of abundant stone supply the use of solid stone construction is the rule. Limestone and chalk and chert are found in northern Normandy, sometimes combined with brick. Slate is often used for roofing, a heavy, light colored variety in Normandy, and a thin, darker kind in Brittany. A buff or grayish stone, often used for the entire building in Brittany, is so hard that it

Brick Detail, House of Edwin C. Duble, Esq., Forest Hills, N. Y.
Frank J. Forster, Architect

cannot easily be carved, and the resulting architecture is somewhat more severe than that of Normandy.

The Worcestershire region of England, particularly near Broadway, abounds in fine examples of limestone construction. The quoin stones, window and door frames, and copings are of smoothly dressed stones, while the rest of the walls are of irregular sized and rougher faced stones. Interesting houses of a warm, buff colored limestone can be found in Chipping Campden, Stanton, and Bilbury, in Gloucestershire. Even the roofs of these houses are often of thick slabs of limestone. Warwickshire has many fine examples of half-timber construction. Kent and Surrey excel in half-timber and brick construction. I know of no more interesting or instructive method of studying architecture than by traveling in rural England or France. One finds the same idea worked out many times, a similarity of mass and design running through all the architecture, but details and decorative motifs differ with use of dissimilar materials and ways of using them.

The greater part of the beauty found in this Old World architecture lies in the materials used and the way in which they are handled. The stone selected is rich and warm in color and texture, and it is laid with all joints filled in flush with the stone. Often the stone itself is partially or wholly parged over with cement, which gives a very pleasing surface. Large quoin stones are used at the corners of the structures, around doors and windows, and when-



Detail of Large and Small Stonework, House of Milton Hatfield, Esq., Montclair, N. J.
Frank J. Forster, Architect

ever an appearance of extra strength is needed. The carving may be elaborate or very simple, according to the fancy or means of the builder. Patterned brickwork affords another means of enriching plain wall surfaces, often employed in the peasant architecture of both France and England. Much of the brick is quite old and is longer and thinner than modern brick. Its texture and color are more variegated than those of modern brick, because of impurities in the clay and unequal baking in the kiln. The brick are laid up in any number of simple patterns, such as herringbone, checkerboard and variations of the cross motive. Often brick and stone and chert will be found together in one wall, laid in checkered designs or in belt courses, and always showing great skill in manipulation and imagination in the use of designs. Where half-timber construction is used, the timbers are always solid, sturdy pieces, generous in proportions. They are hand-adzed and hand-carved, which adds infinitely to the richness of their texture. The material used for filling in between the timbers, brick or stucco is brought flush with the wood. All timbers are mortised and tenoned together with strong wooden pins.

When the pitch of the roof is steep, as in the architecture of northern France and much of that of England, the roof masses play an important part in the design of the structure as a whole. In some French dwellings the roof is more important in appearance than are the perpendicular walls. Quite

Brickwork Laid Up in Squares, House of Karl Kuffer, Esq., Scarsdale, N. Y.
Frank J. Forster, Architect

naturally, then, the texture of the roof influences, to a considerable extent, the architectural success of the building. The beauty of the roof likewise depends on materials and workmanship. In Normandy, tile is the usual roofing material, hand-made and of several tones of red in color. Much of it is worked and twisted in the process of firing, and these irregularities add greatly to the richness of the surface. The tile are laid with a very slight exposure to the weather, perhaps not over 4 or 5 inches; the irregularities of the tile are emphasized by an unevenness in laying, and the result is as delightful a roof surface as can be imagined. The slates used in roofing, in both England and Normandy, are quite heavy, and irregular in size. They vary in color from dark grays and greenish grays to deep purplish browns, depending on the locality. These slates also are laid in uneven courses and with very narrow weather exposure. In Brittany the slate is almost all of a dark color, and quite thin, and the beauty of the roofs is almost wholly dependent upon the skill with which the slates are laid. All of the roofs, of no matter what material, are laid with a skill which, so far as I am aware, is not surpassed, a skill which has its source in a deep, instinctive love of beauty and reverence for honest native materials honestly used.

The subject of dormers is important enough to deserve a paragraph for itself. Perhaps in no other one feature is there so clearly displayed the sense of balance and proportion of the native workmen.

The Norman dormers excel in variety and picturesqueness. They are of numerous shapes and sizes,—flat roofed, peaked, or hooded. Some are set directly up from the side walls, while others are perched up on the roof away from the cornice and serve to break up the plain stretch of roof surfaces in the most engaging way. Great skill is shown in their sizes and spacing. The dormers of Brittany and England are usually of a simpler type, peaked or flat, set directly above the vertical walls and forming parts of these walls. All dormers are small in scale in proportion to the size of the whole structure, and are thus kept in their proper subordinate position, a matter too often overlooked in America. The window openings are small compared to the sizes of the dormers themselves, thus preserving in the dormer a feeling of structural sturdiness. It is quite apparent that in this country the problem of the dormer is not understood, or at least is not given sufficient study. Many a good house is ruined, architecturally, by oversized and poorly placed dormers as observation almost anywhere will prove.

There is, to my mind, no type of European architecture so adaptable to our uses in America as the English or Norman country house. It is appropriate climatically, and so far as use of materials is concerned, we have at our command all of the natural products found in the old buildings. The style is informal, and hence appropriate to our modern way of living. The interiors of the buildings must necessarily be modified to conform with our American ideas of comfort and practicability, but American architects are masters in the art of planning convenient and livable interiors. Because of its plastic, informal qualities, the English and French architecture can be made to conform to any conceivable interior arrangement. Though we excel in the planning of practical and healthful houses, we often fail in designing houses which are harmonious and beautiful, and this, in my opinion, is an equally important matter. If architecture is to be an art, rather than a trade, it must satisfy the spirit as well as the body. Both the æsthetic and the physical needs of human beings must be considered. In our efforts to reproduce in this country the English or Norman type of dwelling, we can be successful only if we absorb the spirit and vitality of the old work. We cannot make a line-for-line copy of an old building, and then expect to inject into our copy anything of the real essence of the original if we use our modern machine-made and artificial building products indiscriminately. Fine as this old architecture is in design, the greater part of its charm is due to a sympathy for and understanding of honest, natural materials, skillfully and appropriately employed. We must use, whenever possible, old hand-wrought materials, or at least the best of the modern. We must teach workmen to use these materials with imagination and a feeling for their intrinsic beauty. The workmanship and materials throughout a structure must be the finest obtainable. Above all, architects must constantly strive for a better understanding of the spirit behind this ancient European architecture. Only by such means can we ever hope to bring into being in this country an architecture comparable in beauty with that of the best in England and France.

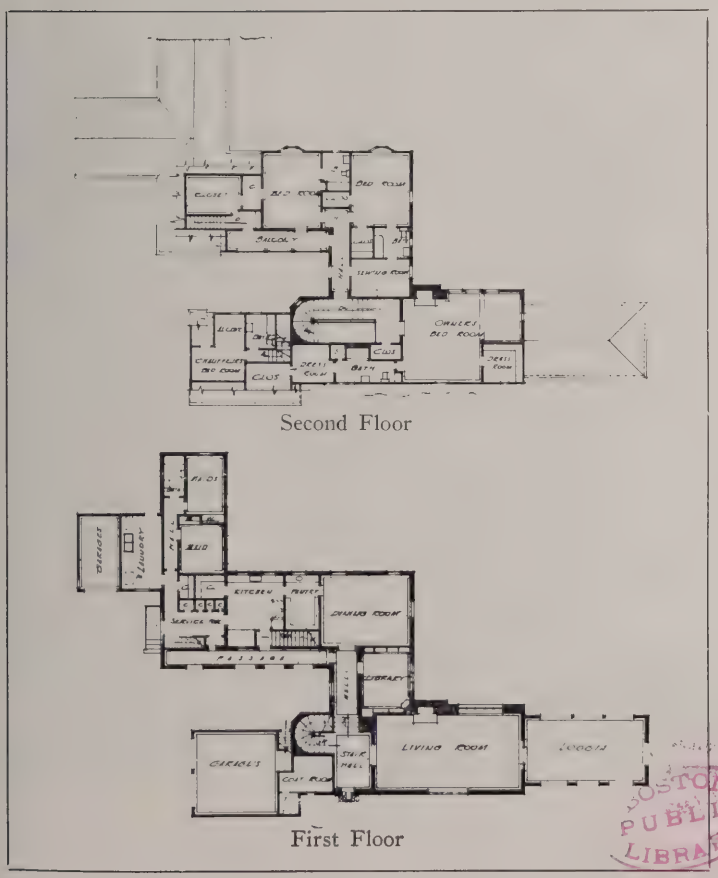
Half Timber and Brickwork

Porch in French Peasant Style

Details from the House of Edwin C. Duble, Esq., Forest Hills, N. Y.

Frank J. Forster, Architect

Plans and Elevation, House of Jack Huber, Esq., Los Angeles
Gordon B. Kaufmann, Architect



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THERE have been many adaptations in recent years of the farmhouses of Normandy and Brittany. Roofs of varied slopes and materials have been used in combinations with stone, brick, stucco and half-timber for the walls. The majority of these adaptations have definitely attempted to produce a picturesque and artistic effect. Too often, however, simplicity and dignity, which are definite characteristics of these farmhouses of France and England, have been lost. Much of the charm of this house of Mr. Huber's outside of Los Angeles, is due to the long, simple roof lines. Whitewashed stonework of the first story and the overhang and smooth plaster of the second make a pleasant contrast and obviate the possibility of there being monotony in the unbroken wall surfaces. A spacious living porch, which forms the east wing, has long openings in the wall just below the eave line which permit cross ventilation through the porch and relieve the austerity of the otherwise unbroken wall. From the two illustrations shown on these pages it is impossible to appreciate the size of this house. The plan is as interesting as it is unusual. It is practically two houses joined by a middle section, in which are located hall and library.

Photos. W. M. Clarke

ENTRANCE TERRACES, HOUSE OF JACK HUBER, ESQ., LOS ANGELES
GORDON B. KAUFMANN, ARCHITECT

ENTRANCE FRONT AND GARAGE

SERVICE PORCH

COURTYARD

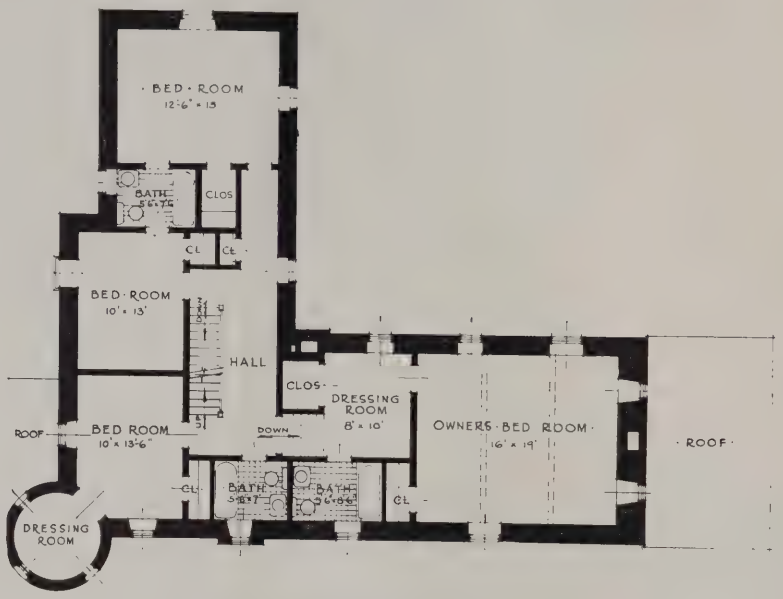
Photos. John Wallace Gillies, Inc. *Plans on Back*

HOUSE OF GUISEPPE COSULICH, ESQ., RIVERDALE-ON-HUDSON, N. Y.

FRANK J. FORSTER, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: September 1, 1927.
General Type of Construction: Masonry.
Exterior Materials: Random rubble stone.
Roof: Heavy graduated slate.
Floors: Wide oak boards in main rooms; narrow in service.
Heating: Hot water.
Interior Woodwork: Stained oak.
Interior Wall Finish: Natural plaster finish; white coat finish in service and bathrooms.
Interior Decorative Treatment: Stained woodwork; painted baths and service rooms.
Approximate Cubic Footage: 54,711.
Cost: $1.20 per cubic foot.



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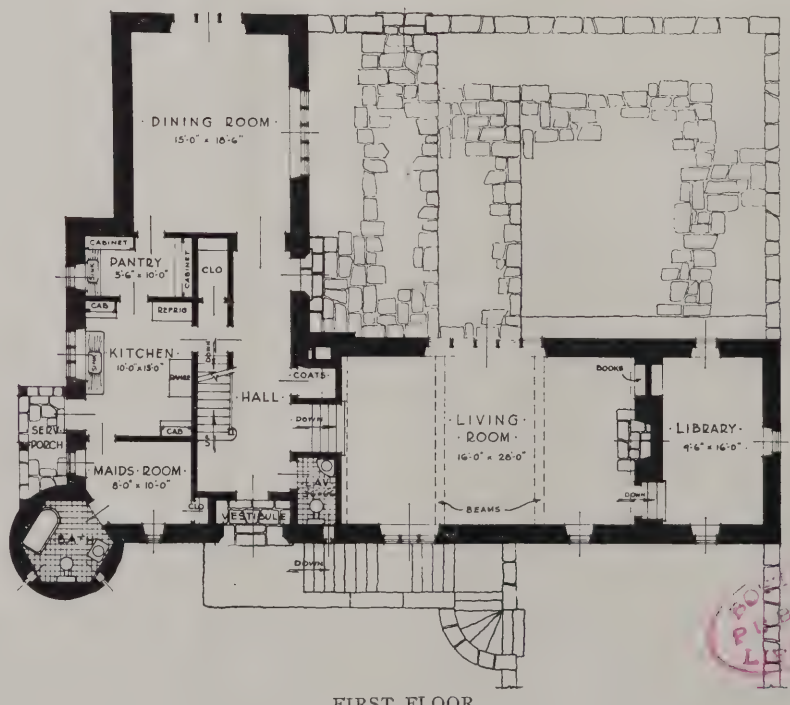

FIRST FLOOR

PLANS: HOUSE OF GUISEPPE COSULICH, ESQ., RIVERDALE-ON-HUDSON, N. Y.
FRANK J. FORSTER, ARCHITECT

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ENTRANCE FRONT

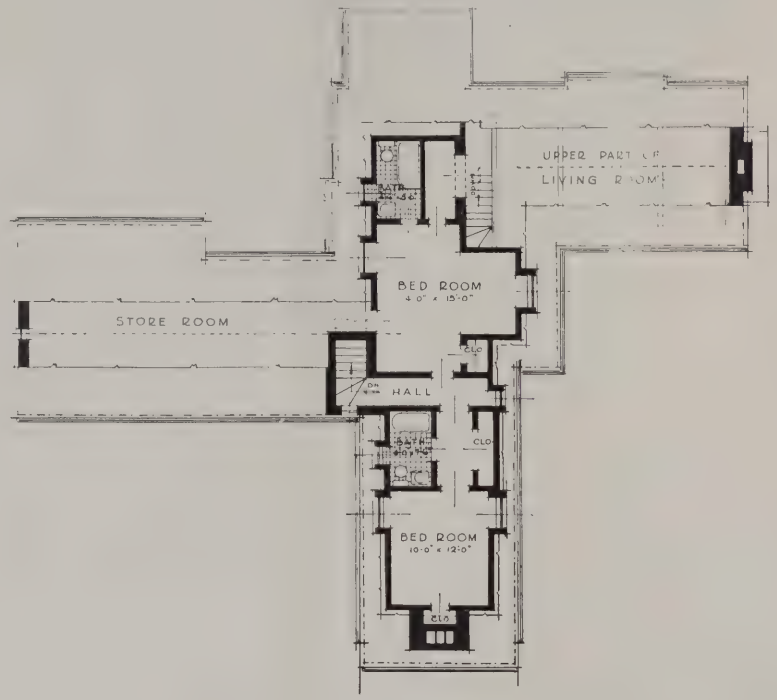
Photos. John Wallace Gillies, Inc. *Plans on Back*

HOUSE OF MILTON E. HATFIELD, ESQ., MONTCLAIR, N. J.

FRANK J. FORSTER, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: January, 1926.
General Type of Construction: Frame.
Exterior Materials: Stucco; brick; stone.
Roof: Heavy graduated slate.
Floors: Wide oak boards in main rooms; tile in bathrooms; linoleum in service rooms.
Heating: Hot water.
Interior Woodwork: Stained oak in master rooms; painted whitewood in service and bathrooms.
Interior Wall Finish: Natural plaster finish; white coat in service and bathrooms.
Interior Decorative Treatment: Stained woodwork; painted service and bathrooms.
Approximate Cubic Footage: 36,717.
Cost: 87 cents per cubic foot.



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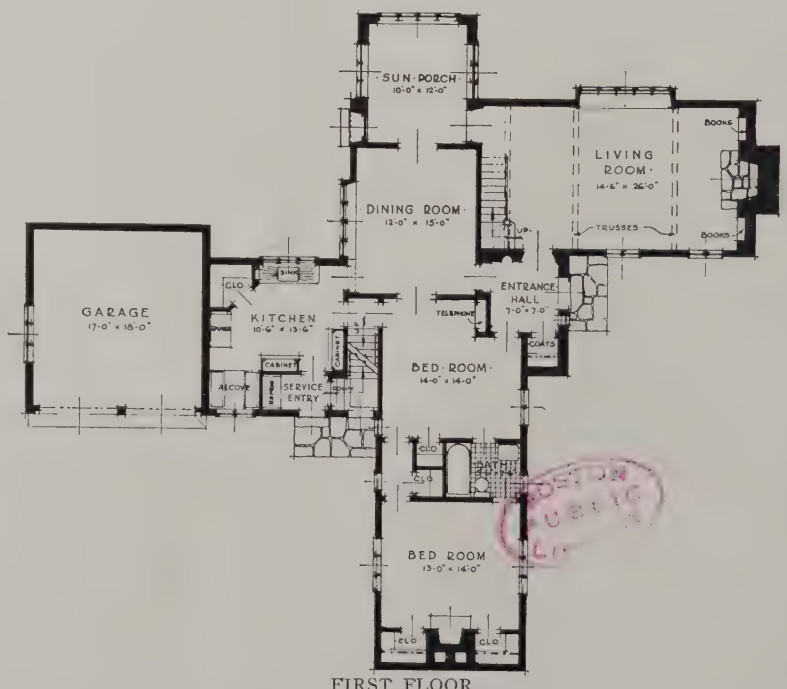


FIRST FLOOR

PLANS: HOUSE OF MILTON E. HATFIELD, ESQ., MONTCLAIR, N. J.
FRANK J. FORSTER, ARCHITECT

ENTRANCE FRONT

Photos. John Wallace Gillies, Inc.

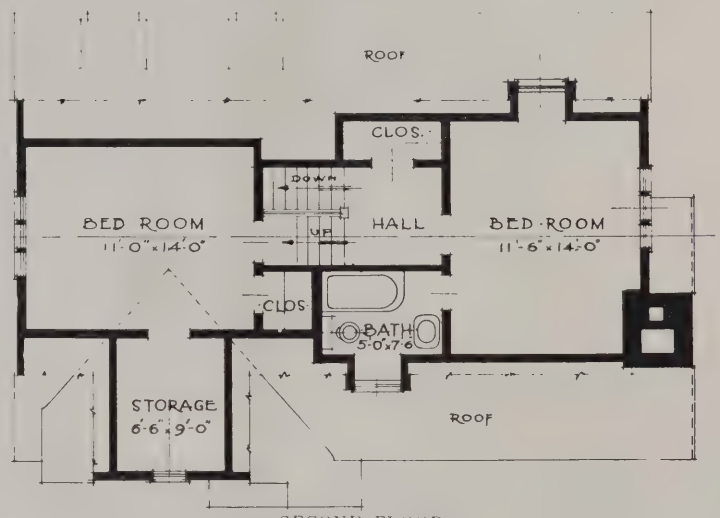
Plans on Back

HOUSE OF KARL KEFFER, ESQ., SCARSDALE, N. Y.

FRANK J. FORSTER, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: April, 1926.
General Type of Construction: Frame.
Exterior Materials: Stucco and brick.
Roof: Shingle.
Floors: Oak.
Heating: Hot water.
Interior Woodwork: Stained oak.
Interior Wall Finish: Natural plaster unfinished; stained woodwork; service and bathrooms, painted.
Approximate Cubic Footage: 23,600.
Cost: 82 cents per cubic foot.



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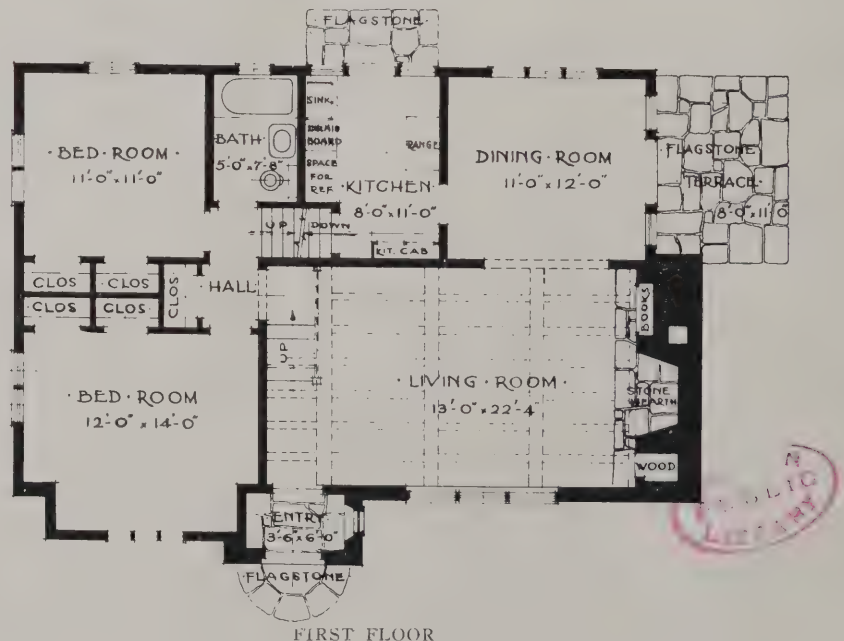


FIRST FLOOR

PLANS: HOUSE OF KARL KEFFER, ESQ., SCARSDALE, N. Y.
FRANK J. FORSTER, ARCHITECT

ENTRANCE FRONT

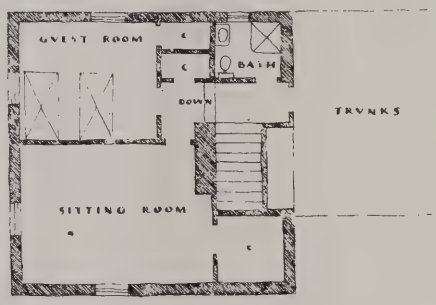
Photos. Harold D. Eberlein *Plans on Back*

HOUSE OF MRS. BENJAMIN S. COMSTOCK, PRINCETON, N. J.

FRANCIS ADAMS COMSTOCK, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1926.
General Type of Construction: Frame.
Exterior Materials: 4-inch brick veneer.
Roof: Blue-black slate 3/16 inch thick, 4 inches to weather.
Floors: Oak, except in service rooms.
Heating: Vapor vacuum system.
Interior Woodwork: Whitewood.
Interior Wall Finish: Painted throughout.
Approximate Cubic Footage: 48,000.
Total cost: $24,800, exclusive of grading, etc.



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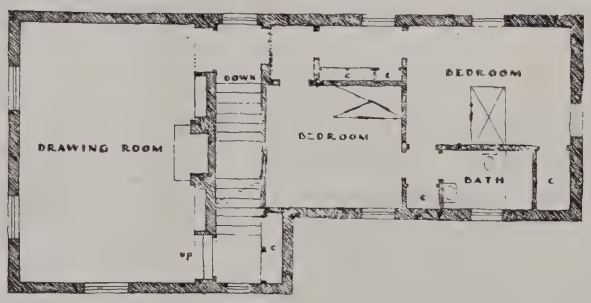

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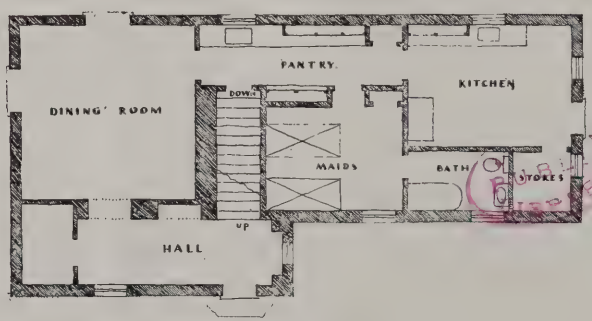


FIRST FLOOR

PLANS: HOUSE OF MRS. BENJAMIN S. COMSTOCK, PRINCETON, N. J.
FRANCIS ADAMS COMSTOCK, ARCHITECT

ENTRANCE FRONT

MAIN ENTRANCE

GARDEN TERRACE

Photos. John Wallace Gillies, Inc.

Plans on Back

HOUSE OF F. A. SCHAFF, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT

CONSTRUCTION DATA

General Type of Construction: English.

Exterior Materials: Stone, half-timber and stucco.

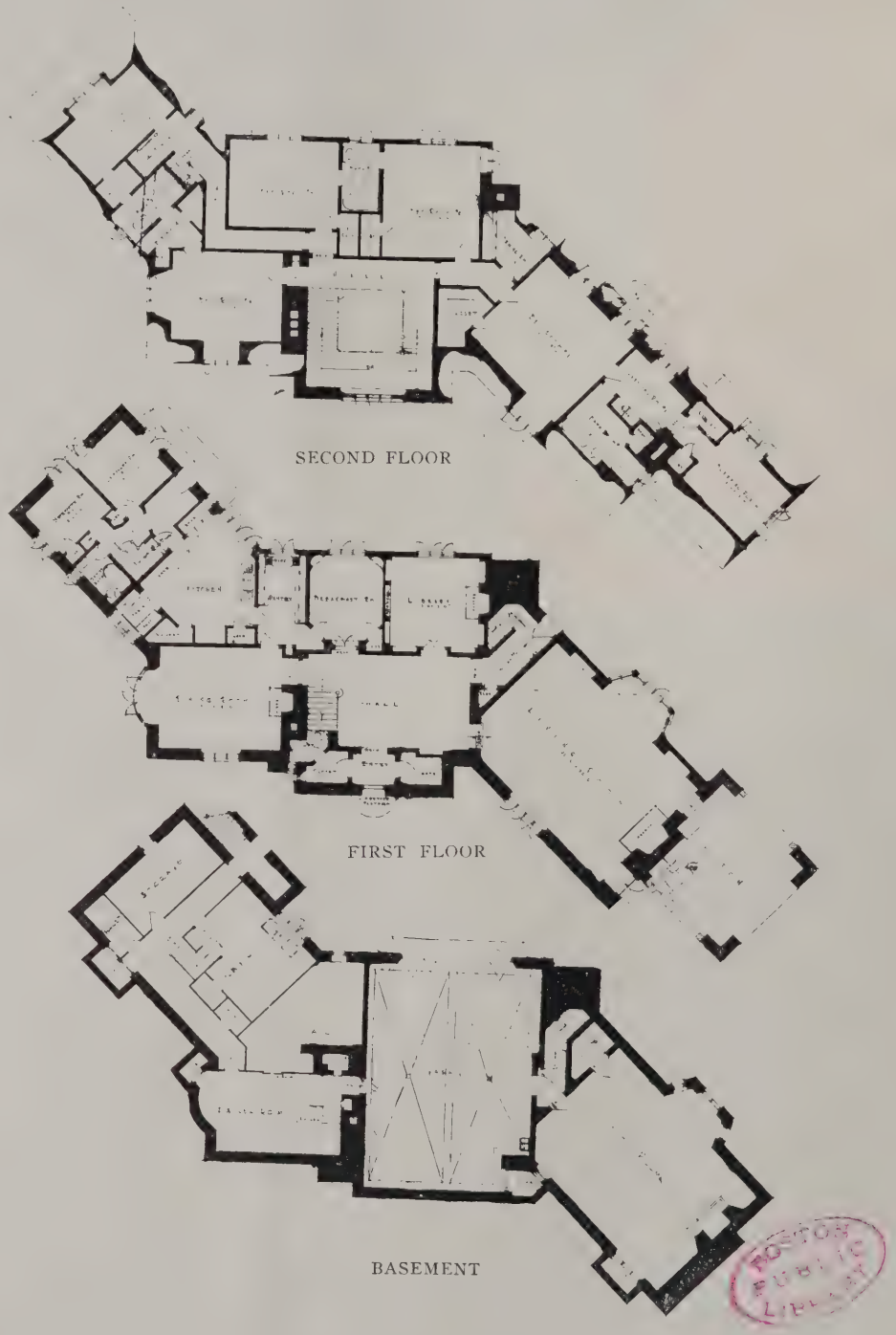
Roof: Tile.

Floors: Oak.

Heating: Vapor.

Interior Woodwork: Living room and dining room of oak panels; library of country pine panels; remainder of house of whitewood painted.

Approximate Cubic Footage: 90,500.



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PLANS: HOUSE OF F. A. SCHAFF, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

MAIN HALL

LIVING ROOM

HOUSE OF F. A. SCHAFF, ESQ., BRONXVILLE, N. Y.

LEWIS BOWMAN, ARCHITECT

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ENTRANCE FRONT

Plans on Back

LIVING ROOM

HOUSE OF G. HAYWARD NIEDRINGHAUS, ESQ., ST. LOUIS

BEVERLEY T. NELSON, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1927.

General Type of Construction: Masonry, semi-fireproof.

Exterior Materials: Brick and concrete.

Roof: Slate.

Heating: Vapor system.

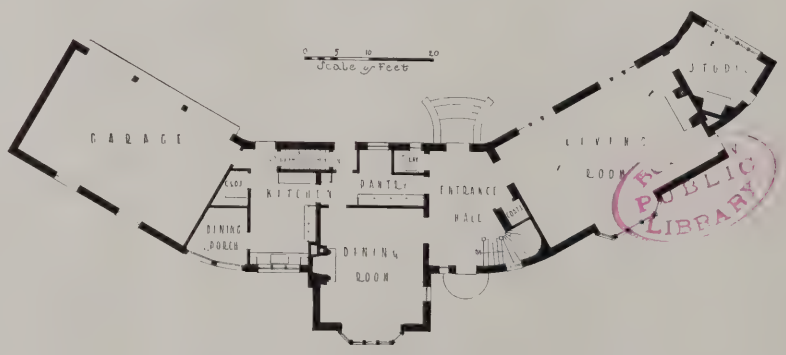
Interior Woodwork: Living room paneled in pine.

Interior Wall Finish: Halls and dining room in colored stucco; bedroom papered.

Approximate Cubic Footage: 58,125.

Total Cost: $45,000.

SECOND FLOOR



FIRST FLOOR

PLANS: HOUSE OF G. HAYWARD NIEDRINGHAUS, ESQ., ST. LOUIS

BEVERLEY T. NELSON, ARCHITECT

ENTRANCE FRONT

Photos. Harold D. Eberlein *Plans on Back*

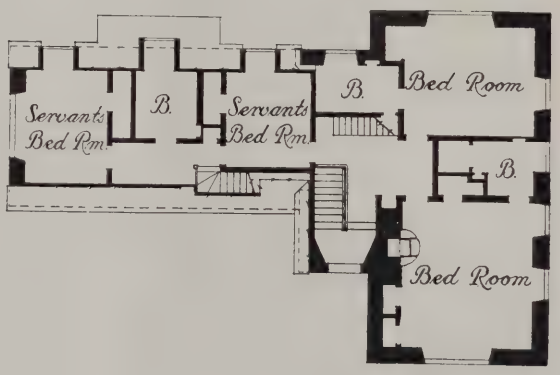
SERVICE WING

HOUSE OF J. T. LAZARUS, ESQ., ITHAN, PA.

DAVIS, DUNLAP & BARNEY, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: September 1926.
General Type of Construction: Non-fireproof.
Exterior Materials: Local stone.
Roof: Wood shingles.
Floors: Rift pine.
Heating: Hot water.
Interior Woodwork: White pine.
Interior Wall Finish: White plaster and sand plaster.
Interior Decorative Treatment: Wall paper and paint.
Approximate Cubic Footage: 42,000.
Total Cost: $25,000.



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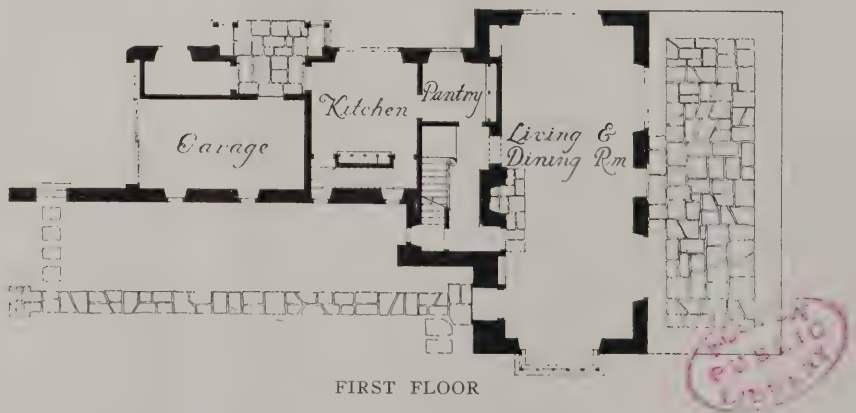

FIRST FLOOR

PLANS: HOUSE OF J. T. LAZARUS, ESQ., ITHAN, PA.
DAVIS, DUNLAP & BARNEY, ARCHITECTS

GARDEN TERRACE

ENTRANCE DOOR

HOUSE OF J. T. LAZARUS, ESQ., ITHAN, PA.

DAVIS, DUNLAP & BARNEY, ARCHITECTS

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ENTRANCE FRONT

Plans on Back

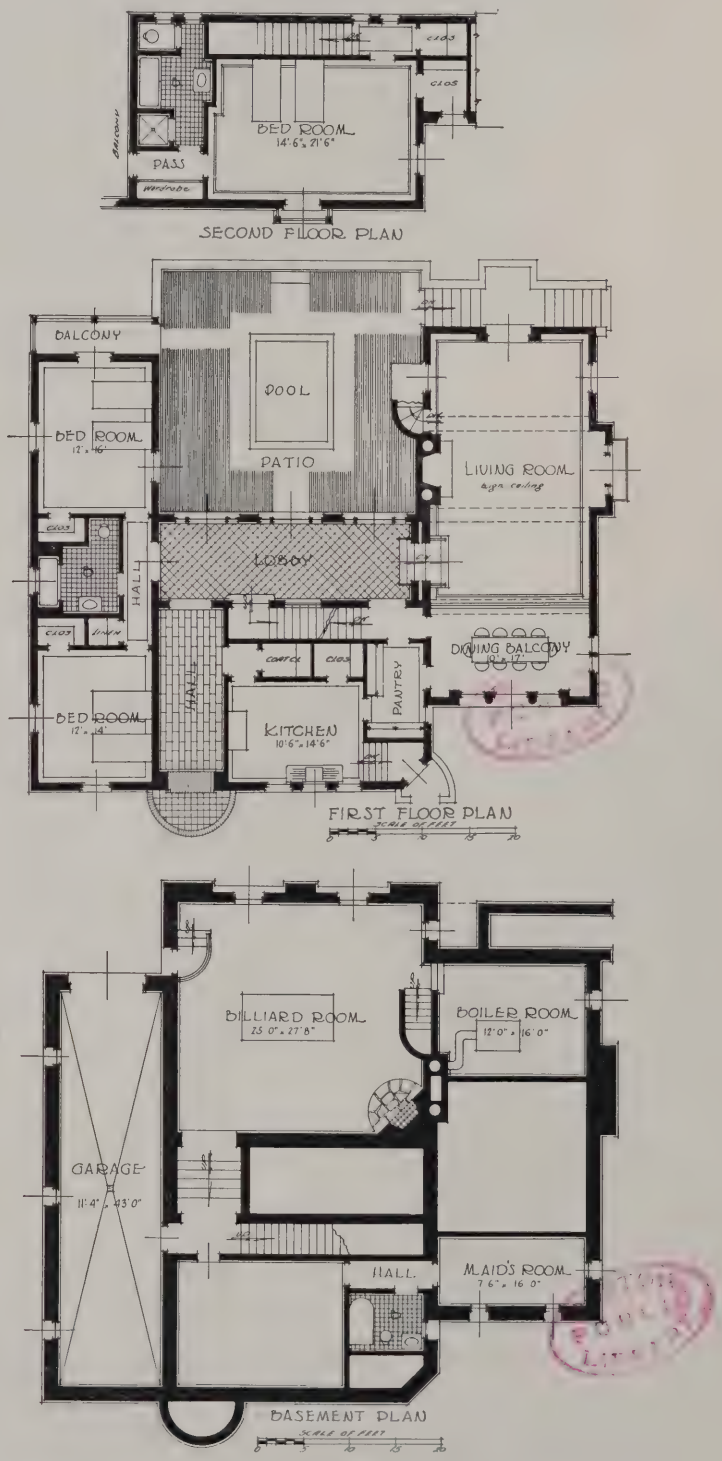
GARAGE WING

HOUSE IN THE ITALIAN STYLE AT SCARSDALE, N. Y.

R. C. HUNTER & BRO., ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: October, 1927.
General Type of Construction: Exterior walls, hollow tile; wood floor beams.
Exterior Materials: Stucco.
Roof: Hand-made Spanish tile.
Floors: Composition and wood.
Heating: Hot water.
Interior Woodwork: Pecky cypress.
Interior Wall Finish: Rough-cast plaster; main rooms have timbered ceilings.
Interior Decorative Treatment: Early Spanish.
Approximate Cubic Footage: 49,500.
Total Cost: $29,700.



PLANS: HOUSE IN THE ITALIAN STYLE AT SCARSDALE, N. Y.
R. C. HUNTER & BRO., ARCHITECTS

BILLIARD ROOM WINDOWS

ENTRANCE DOOR

HOUSE IN THE ITALIAN STYLE AT SCARSDALE, N. Y.

R. C. HUNTER & BRO., ARCHITECTS

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LIVING ROOM FROM THE GARDEN

Photos. Padilla Company

Plan on Back

FOUNTAIN IN THE ENTRANCE PATIO

HOUSE OF FRANCIS MARION THOMPSON, ESQ., BEVERLY HILLS, CAL.

WALLACE NEFF, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: September, 1925.
General Type of Construction: Frame.
Exterior Materials: Stucco.
Roof: Hand-made tile.
Floors: Hand-made tile.
Heating: Hot air; Gas furnace.
Interior Woodwork: Spanish cedar.
Interior Wall Finish: Textured plaster.
Approximate Cubic Footage: 123,000.
Total cost: $100,000.

PLAN OF HOUSE AND GROUNDS

HOUSE OF FRANCIS MARION THOMPSON, ESQ., BEVERLY HILLS, CAL.
WALLACE NEFF, ARCHITECT

DINING ROOM FROM THE GARDEN

STAIRWAY FROM THE ENTRANCE PATIO

HOUSE OF FRANCIS MARION THOMPSON, ESQ., BEVERLY HILLS, CAL.

WALLACE NEFF, ARCHITECT

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ENTRANCE LOGGIA

Photos. The Mott Studios

Plan on Back

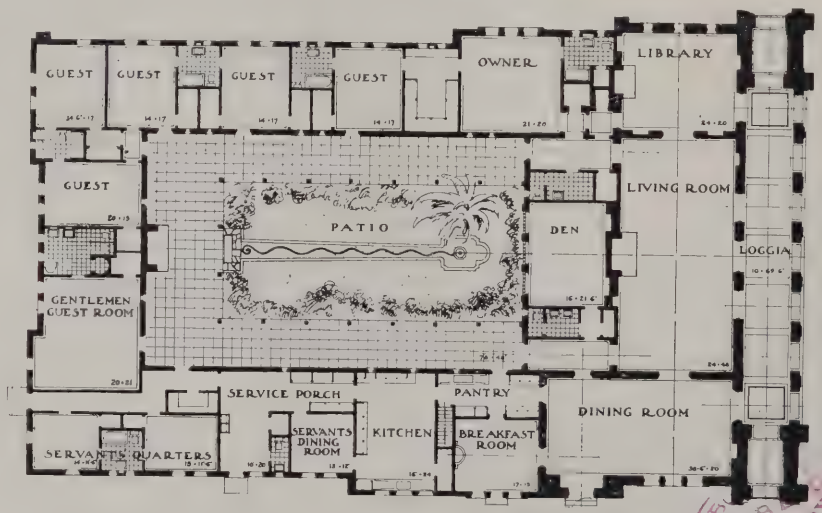
LOGGIA AT END OF PATIO

EXECUTIVE RESIDENCE OF SECONDO GUASTI, ESQ., GUASTI, CAL.

MORGAN, WALLS & CLEMENTS, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1924.
General Type of Construction: Brick.
Exterior Materials: Brick, stuccoed.
Roof: Tile.
Floors: Oak; tile in bathrooms.
Heating: Unit system; hot air.
Interior Woodwork: Cedar and Oregon pine.
Interior Wall Finish: Textured plaster, decorated.
Interior Decorative Treatment: Wood beamed ceilings in living room, porches, club room; vaulted ceilings in dining room, and library; vaulted ceilings in main bed rooms.
Approximate Cubic Footage: 221,000.
Cost: 38.8 cents per cubic foot.



PLAN: EXECUTIVE RESIDENCE OF SECONDO GUASTI, ESQ., GUASTI, CAL.
MORGAN, WALLS & CLEMENTS, ARCHITECTS

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LIVING ROOM

BREAKFAST ROOM

EXECUTIVE RESIDENCE OF SECONDO GUASTI, ESQ., GUASTI, CAL.

MORGAN, WALLS & CLEMENTS, ARCHITECTS

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ENTRANCE COURT AND TERRACE

Photos. Padilla Company *Plan on Back*

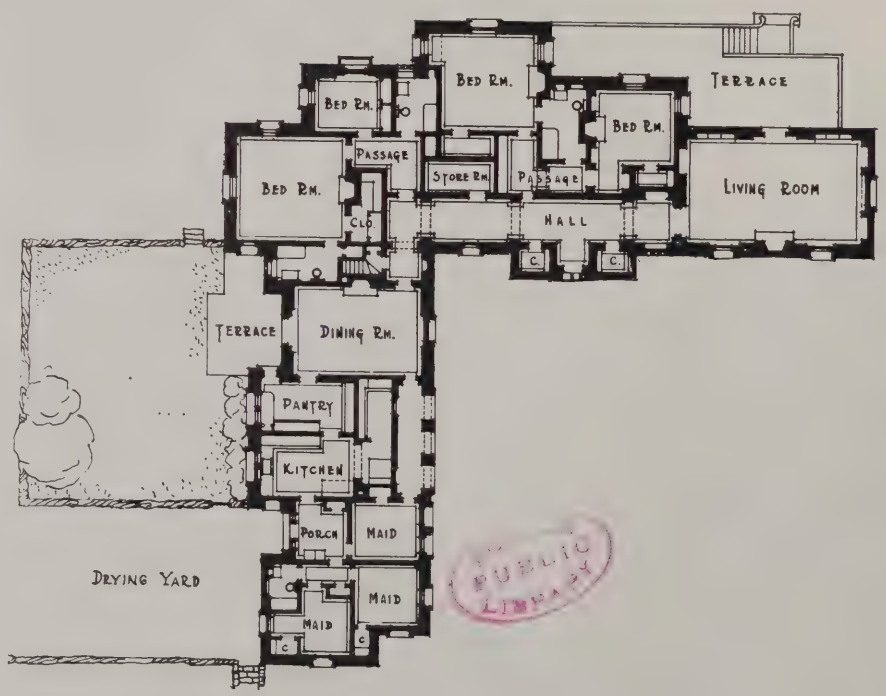
LIVING ROOM

HOUSE OF CURTIS W. CATE, ESQ., CARPINTERIA, CAL.

REGINALD D. JOHNSON, ARCHITECT

CONSTRUCTION DATA

General Type of Construction: Concrete foundation; brick walls.
Roof: Shingle roof.
Floors: Hardwood and tile.
Heating: Electrical and fireplaces.
Interior Woodwork: Oak and pine.
Interior Wall Finish: Plaster; oak paneling.
Interior Decorative Treatment: Early American and English.
Approximate Cubic Footage: 71,254.



PLAN: HOUSE OF CURTIS W. CATE, ESQ., CARPINTERIA, CAL.
REGINALD D. JOHNSON, ARCHITECT

PUBLIC LIBRARY

A SMALL-TOWN HOUSE

ROBERT H. SHERLOCK, ARCHITECT

BY

PARKER MORSE HOOPER

THERE is no more interesting type of architectural design than that pertaining to the home, and in no field of American architecture has such tremendous progress been made during the past quarter-century as in that of the country house. Whether large or small, costly or inexpensive, pretentious or simple, tremendous improvement has been accomplished. This is due partly to the growing good taste of the public in general, and partly to the increased skill of the profession itself. In the problem of designing a commercial building, which is distinctly typical of our present civilization, it seems logical and permissible to break away from precedent, as none exists for our modern skyscrapers, and design something distinctly new and different,—new, because the problem is new, and different because no precedent exists. Possibly the modern feeling expressed in our commercial architecture may eventually creep into our city domestic architecture. It does not, however, seem likely or reasonable that any marked degree of the modern expression should or can evince itself in our country house architecture.

At our very doors on every side there exist splendid examples of early American domestic architecture which should be and are very largely used as precedent for modern work in this particular field. The Colonial houses of Boston, Philadelphia, Newburyport, Salem and Portsmouth give us numerous suggestions and inspiration for the large and small-town houses of today. Particularly in New England do we find countless examples of the story-and-a-half, or cottage type of country house, so common on Cape Cod and the coast of Maine. There are such charming examples to inspire us, that it is hard to believe that the angular, box-like modernistic style of house being built in France and Germany today will ever gain a permanent foothold in this country.

When one sees such delightful examples of the modern small-town house as the three shown on these pages, it is difficult to understand why any homebuilder should desire a house of the modern, flat-roofed, angular, bleak and forbidding type. In one of these houses, which faces one of the elm-lined streets of Geneseo, N. Y., there is found all of the charm of carefully studied proportions, graceful roof lines, and refined and delicate detail characteristic of the homes of our New England ancestors. The relation of the height to the width of this house is particularly fortunate. The short wing at the rear, which connects the garage with the house itself, is unusually well designed and adds to rather than detracts from the charm and dominance of the main house. The windows are well proportioned, with 12 panes to each sash. The louver shutters also add distinction and charm to the design. The entrance porch is kept suitably small and is consistently tied into the house itself. It is to be earnestly hoped and desired that more people building small and inexpensive homes should employ the services of real architects or those of an organization made up of architects, such as the Small House Service Bureau of the American Institute of Architects.

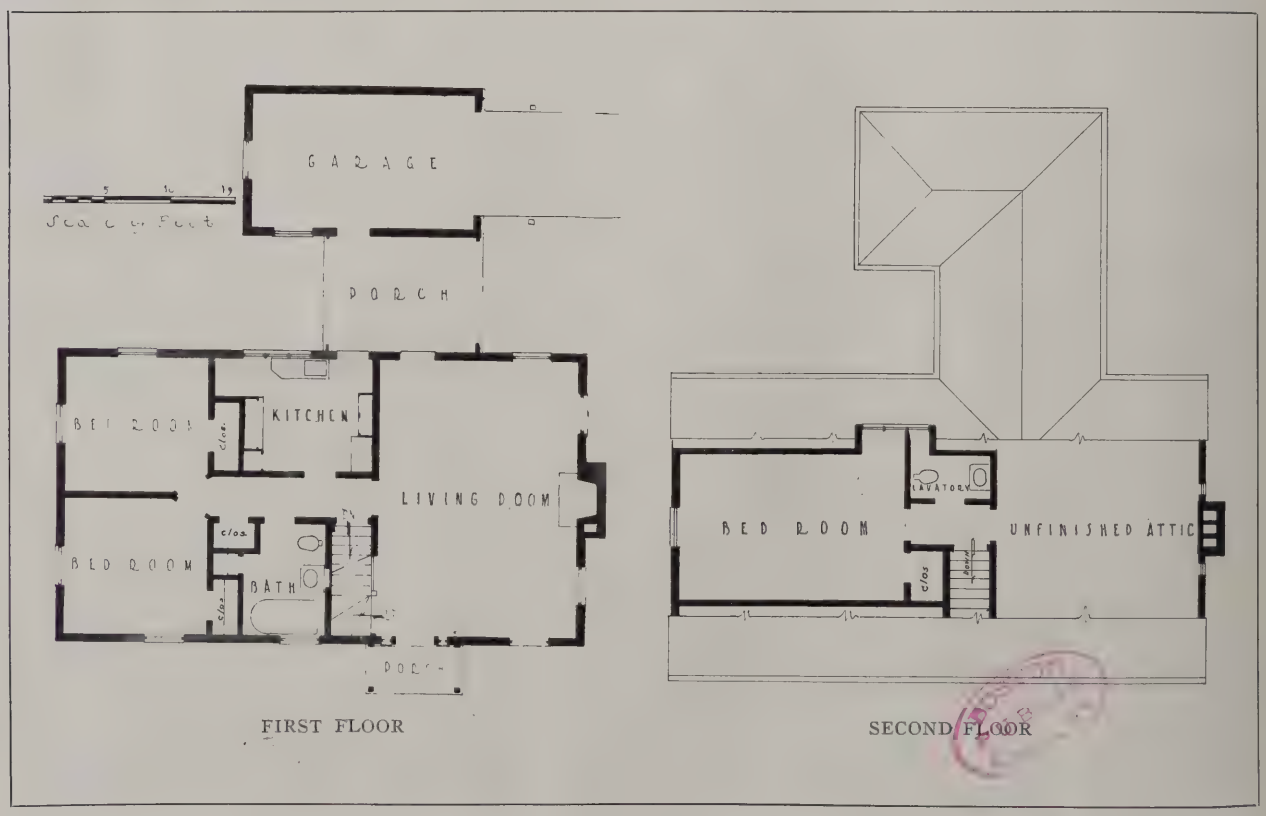
House of Miss Elinor McBride, Geneseo, N. Y.

HOUSE OF MISS ELINOR McBRIDE, GENESEO, N. Y.
ROBERT H. SHERLOCK, ARCHITECT

LIVING ROOM

HOUSE OF MISS ELINOR McBRIDE, GENESEO, N. Y.
ROBERT H. SHERLOCK, ARCHITECT

LIVING ROOM END, PORCH AND GARAGE



FIRST FLOOR SECOND FLOOR

HOUSE OF MISS ELINOR McBRIDE, GENESEO, N. Y.
ROBERT H. SHERLOCK, ARCHITECT

A COUNTRY HOUSE OF CONCRETE

BY

HERBERT LIPPMANN, ARCHITECT

THE owners of this house expressed dislike of the appearance of wood-framed buildings, whether finished in siding or stucco. They were averse, too, to the use of brick as a building material. They had seen and admired rubble stone walls and rubble-faced concrete. Use of the latter materials was unreasonable in cost because there was no stone in the immediate vicinity, and because of the union wage scale for stone masons in their section. Under these circumstances a simple system of hollow reinforced concrete wall construction was recommended. The clients were shown barns and silos built according to this method, were readily interested in its appearance, and were convinced of its practicability for residential purposes. The requirements, otherwise, were that a house to cost $20,000 must contain four master bedrooms, two bedrooms for servants, three bathrooms, a playroom, a guest room and wash room, a kitchen, and a spacious room which could be used as living and dining room combined. The cellar is used for laundry and boiler room, and the grade of the site makes possible use of a portion under the kitchen as a garage. The living room is 31 feet by 17 feet, 6 inches, planned so that the living portion can be used separately from the dining portion. The combination playroom and guest room is located conveniently to the kitchen, so that children can be served there when their elders are entertaining. This room is provided with patented folding beds which stand in special closets, and cupboards have been built to contain children's toys. It is in this way that the playroom is converted into the guest room, the transformation being quickly made.

A hollow concrete type wall system was specified, but for comparison, alternate estimates were taken on brick walls and on stud walls, sheathed and with brick veneer. These proved to be more costly, despite the fact that only two of the bidders had had any previous experience with the first specified method of construction. No wooden forms or centering, other than for openings, and no scaffolding, were required. The walls were actually constructed by one intelligent mason, assisted sometimes by one and sometimes by two laborers. The laborers had had no experience as masons, and the mason, acting as foreman, had had no previous experience with the particular system, which was to him quite new.

In this system steel forms are used, the forms being 9 feet high and 2 feet or 5 feet long. Use of them was begun at the footings and carried the entire masonry wall height. Below grade, the walls were specified as two 6-inch shells, separated by a 2½-inch air space. A half-round land tile was laid to drain, open and upward, in the concrete footing directly below this air space; this takes the place of the customary girdle drain. The upper walls were built

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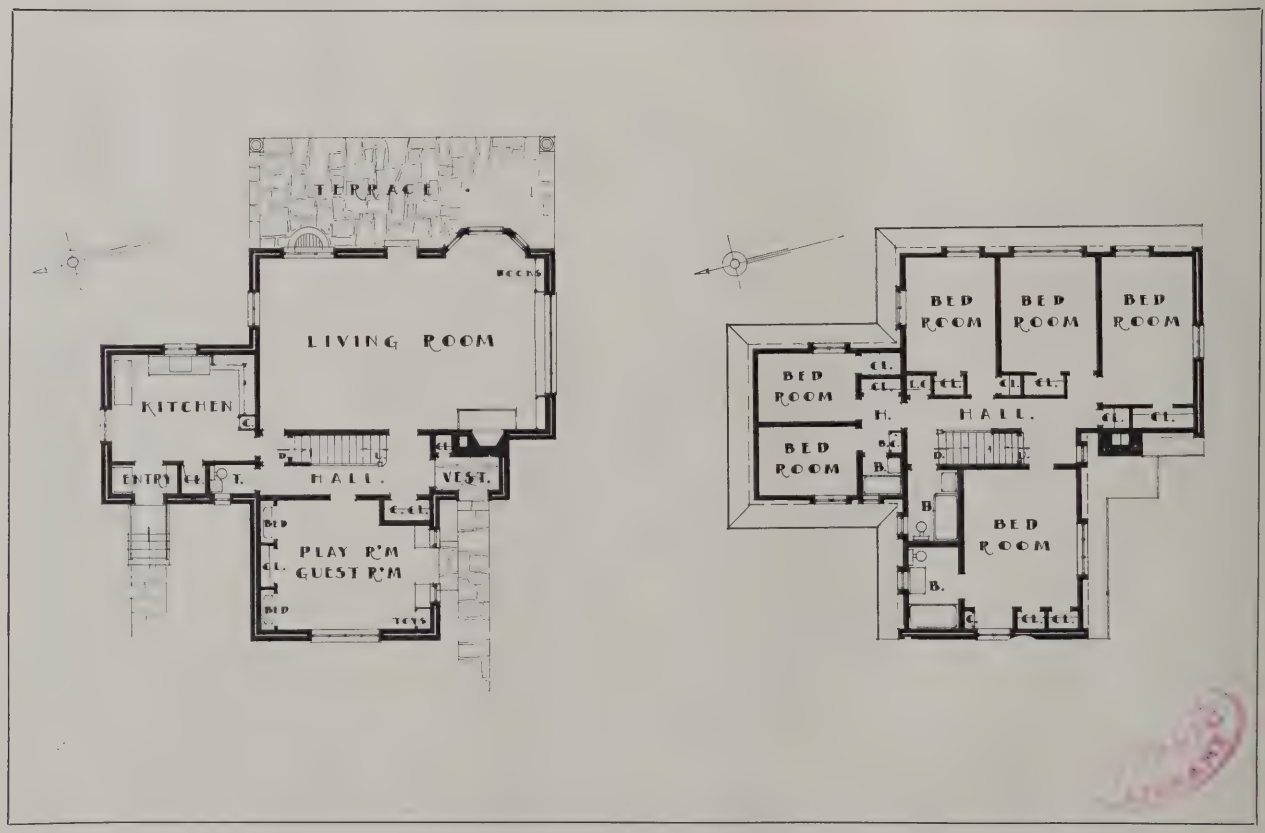
Photos. George H. Van Anda

House of A. Harris, Esq., White Plains, N. Y.
Herbert Lippmann, Architect

LIVING ROOM WINDOWS AND TERRACE



FIRST FLOOR SECOND FLOOR

HOUSE OF A. HARRIS, ESQ., WHITE PLAINS, N. Y.

HERBERT LIPPMANN, ARCHITECT

DETAIL SHOWING TEXTURE OF CONCRETE WALLS
HOUSE OF A. HARRIS, ESQ., WHITE PLAINS, N. Y.
HERBERT LIPPMANN, ARCHITECT

of two 4-inch shells, separated by a 2½-inch air space. The air space is continuous around corners and is sealed around openings by placing a 2 by 2½-inch timber in the air space, top, bottom and sides of openings; galvanized 10-penny nails are driven into these timbers to combine with the concrete. The concrete itself, a 1:2:4: gravel mix, had no more water than would make it possible to remove the forms immediately after tamping. General reinforcement consisted of two No. 2 galvanized wires, one top and one bottom, in each 9-inch course. Two ⅜-inch rods are used in lower foundation courses, gable or top courses, and in courses under window openings. Openings have additional rod reinforcement determined by the span. Cross-reinforcing between shells occurs every 2 feet on every course, in the form of galvanized S-anchors 6 inches long with 1-inch hook ends. In the exterior walls the concrete was colored with dry mineral siena, in the proportion of four cups of color to a bag of Portland cement. To this ten cups of white cement were added to reduce the green tendency of the ordinary cement. The walls were left as they came, with the form marks showing. They were neither painted nor stuccoed on the outside. In the vestibule they were left unfinished on the inner side as well. In all rooms they were plastered directly with a scratch leveling coat and a colored sand finish coat. There is no furring on any exterior wall, and none is required. Where stud partitions met concrete walls, the wire lath lapped over the concrete and was fastened to the concrete. This was so successful that no cracks appeared at meeting places, in spite of the fact that the building has settled.

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Fireplace in Living Room

To 2 by 2½-inch timbers sealing the air spaces around openings there were nailed the wood frames for steel sash or wood doors. The timber over openings was covered with a copper flashing which runs 3 inches up the outer side of the inner shell and projects beyond the sash and door frames, as a drip for any condensation or moisture which might run down into the air space and wet the plaster over openings. The heads of two windows had a 1-inch recess left in them, in which faience tile were "buttered on" for the width of these openings. Window sills outside were covered with roofing slate laid to wash. Inner sills were made of faience tile, placed directly on the concrete, and serving as a plaster stop below the windows. Door and window frames were designed to accommodate screens. Wood blocks were set in the concrete walls for curtain rod nailing. Joists were set 3 inches into the inner shell by fire-cutting the timbers and installing the triangular sawed-off portions at the proper intervals for use as a form for joist holes.

This type of wall construction has been dwelt upon in this description because of the interest it has occasioned. There are several other features which might, however, be of interest from the point of view of reduction of cost of such buildings. With this intention, the area below the house not needed for laundry, boiler space, or garage, was unexcavated, and the first floor built on grade leveled with tamped cinders. A 4-inch concrete slab was laid and covered with 2-inch thick corkboard in pitch for insulation. This cork was directly covered with a ¾-inch cement (sidewalk mixture) coat, troweled smooth, and on this latter, by preference of the owners, a finished cork composition floor was placed. This portion of the building includes the playroom, on the floor of which the children play with no danger of ground dampness. Another economy was effected by the use of cork composition floor and base in place of bathroom tiling. Still another saving was made by the use of chestnut trim throughout, inasmuch as this was finished by the carpenters with linseed oil and required no paint or stain. Door jambs in stud partitions are 2-inch thick chestnut, 8 inches wide, rabbeted ¾ inch to receive wire lath and plaster on either side, and installed, oiled, with one additional rough stud all around to make the door openings. Doors themselves are of the batten type, of chestnut boards with H and H- and- L hinges and thumb latches. These were specified as alternate to stock two-panel doors with customary hardware, and were found cheaper as well as more in keeping with the simple early American design of this small house. In this building the concrete construction has amply proved its practicability and demonstrated its merits.

AN EARLY AMERICAN HOUSE AT FARMINGTON, CONNECTICUT

LEIGH FRENCH, JR., ARCHITECT

BY

HAROLD D. EBERLEIN

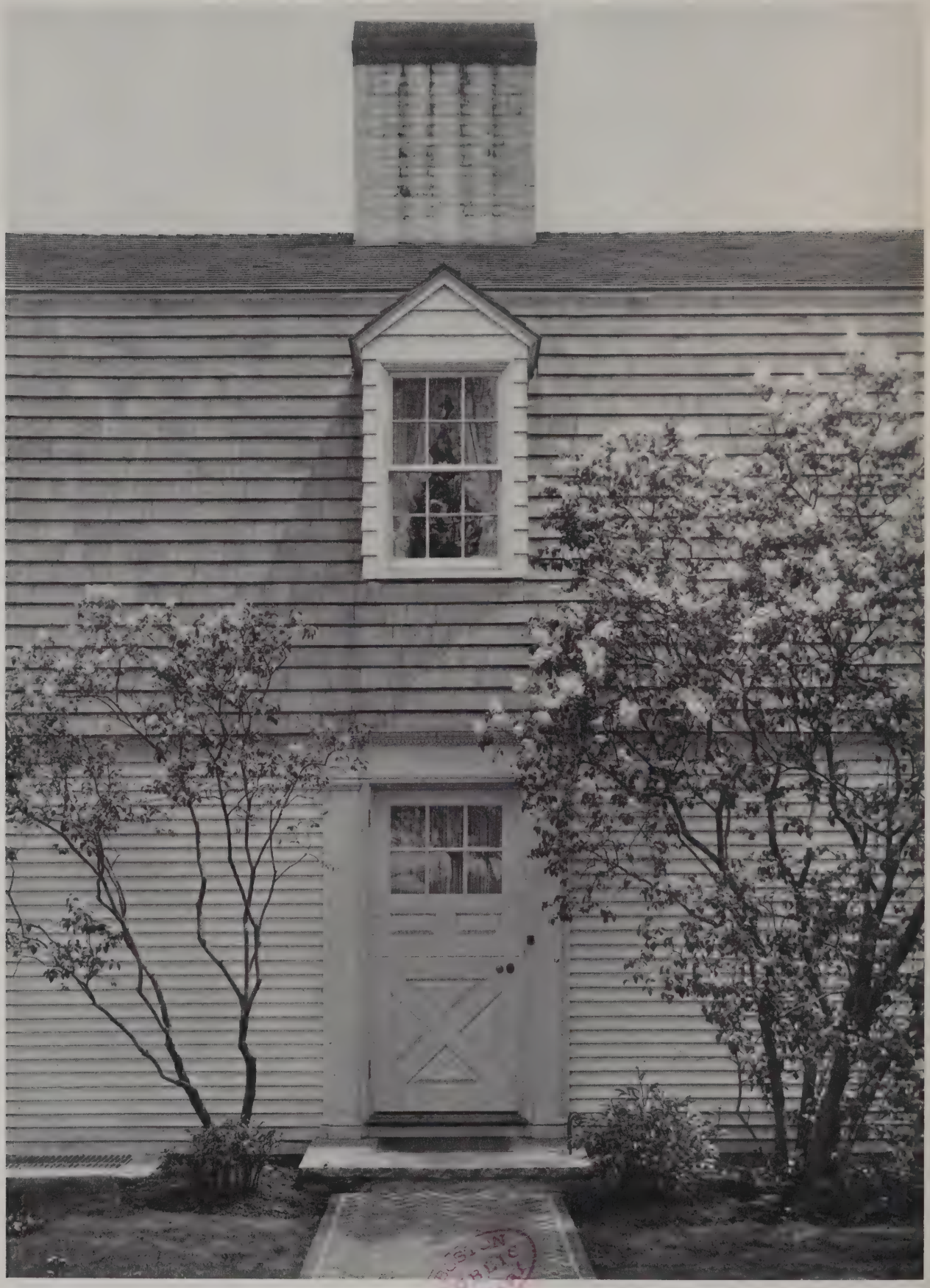
IT is altogether beside the point to dwell at length upon what is plainly to be seen at a glance. It is needless to enter into extended comment on the fact that the small house at Farmington, Conn. illustrated here is designed according to the early Colonial tradition of the neighborhood, with various modifications in plan and adapted interior features in order to make it fulfill satisfactorily the requirements of a modern dwelling, but without disturbing the traditional character of the exterior. To two facts in connection with this house, however, it is distinctly worth while directing attention. In the first place, the house is a small house. Notwithstanding this handicap, it is conspicuously well studied in every particular, both outside and within. It bears every mark of a finished product, not the air of a step-child or changeling, left to shift pretty much for itself.

It cannot be denied that the average small house does suffer a serious handicap architecturally because it *is* a small house. Too often does it "come out at the little end of the horn," especially if it has been designed in a great office with a complex organization or in the office of an architect who specializes in large domestic work. Its unstudied or half-studied details smack of the standardized, and it fails of possessing that individual quality which clients presumably desire when they retain the services of an architect instead of appealing to a building contractor. The architect, to be sure, cannot be held wholly to blame for this unfortunate state of affairs. In order to make a living he must make a reasonable profit on each commission that comes into his office. And the small house, in proportion to the labor, time and thought involved in its design and erection, is relatively not nearly so profitable a subject as a larger commission. In some cases, indeed, it is not at all a source of profit. Quite naturally, then, the architect prefers the larger work, and with good reason he spends upon it his best efforts.

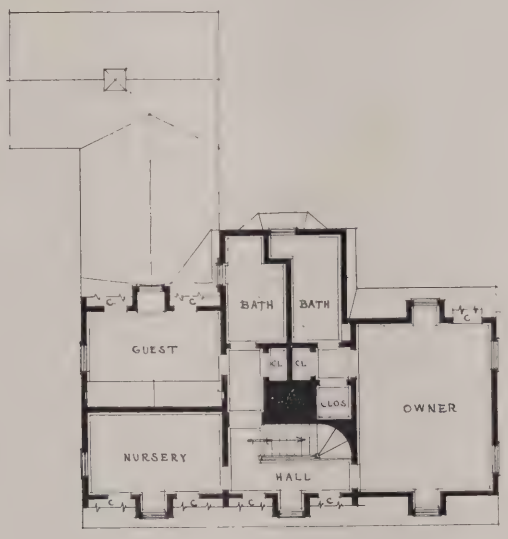
And yet, though a busy architect of prestige may reasonably be chiefly occupied in executing important commissions, is there not something to be said in favor of his giving a little more personal effort and care to the occasional small project? Commensurate profit therefrom, in a pecuniary way, he probably will not get. But the small house is numerically preponderant, and numerical preponderance inevitably imparts the prevailing architectural tone to a neighborhood. Is it not worth while, therefore, to devote a little extra personal interest to the small house in the interests of general architectural betterment? It may seem like "casting one's bread upon the waters," but, in curiously indirect ways, small excellences achieved have a habit of attracting substantial returns in forms that cannot be expressed in figures on the ledgers. At any rate, this Farmington house affords refreshing evidence of studied attention bestowed as freely and conscientiously as though the commission had been five times as large.

The second fact suggested by the Farmington house is that the interior architecture and fixed decoration of a small dwelling exact no less skill and even more mature discrimination than do the same items in the treatment of a large house. Where every least touch assumes a magnified importance, because the field of action is so limited, there is no chance to retrieve or counterbalance any error in judgment. The good has an effect relatively greater.

House of Mrs. Philip Roberts, Farmington, Conn.
Leigh French, Jr., Architect



HOUSE OF MRS. PHILIP ROBERTS, FARMINGTON, CONN.
LEIGH FRENCH, JR., ARCHITECT



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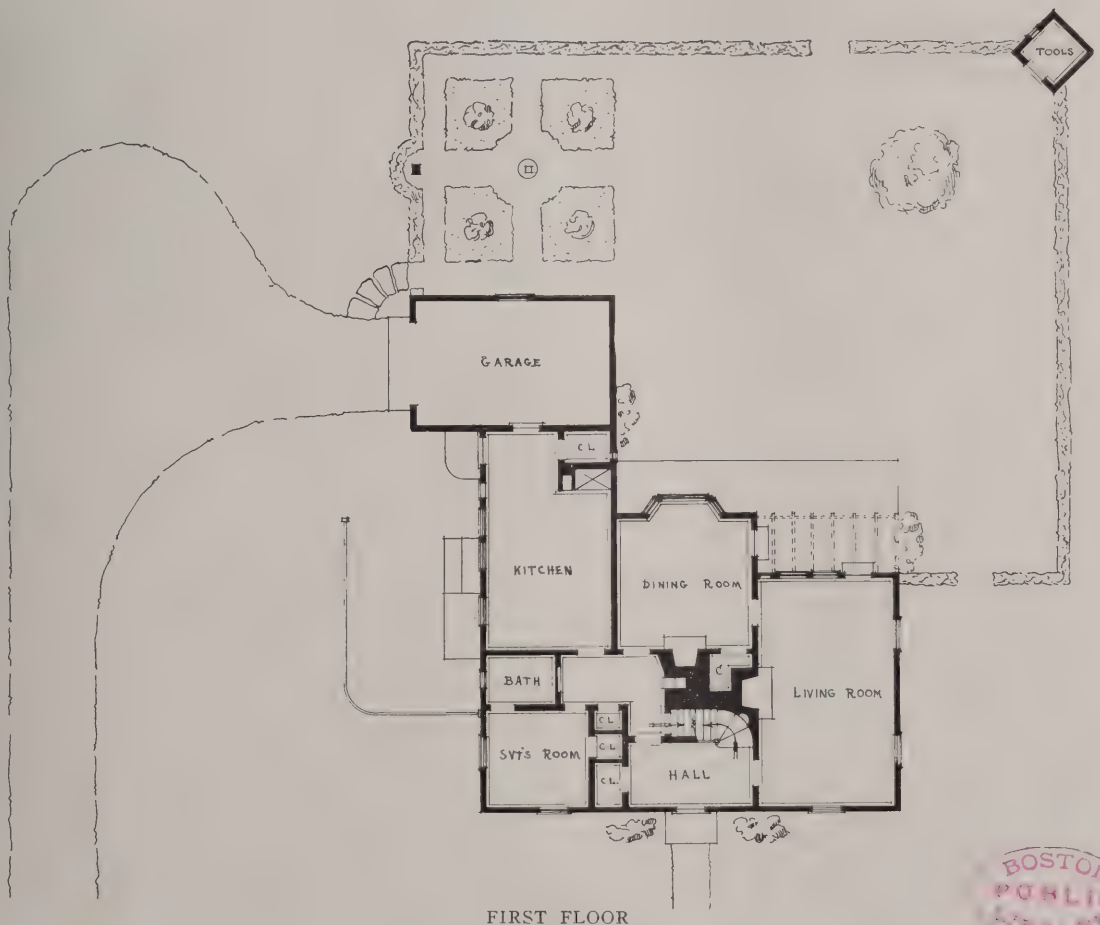

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PLANS: HOUSE OF MRS. PHILIP ROBERTS, FARMINGTON, CONN.
LEIGH FRENCH, JR., ARCHITECT

LIVING ROOM FIREPLACE

DINING ROOM FIREPLACE

STAIRCASE

GUEST ROOM

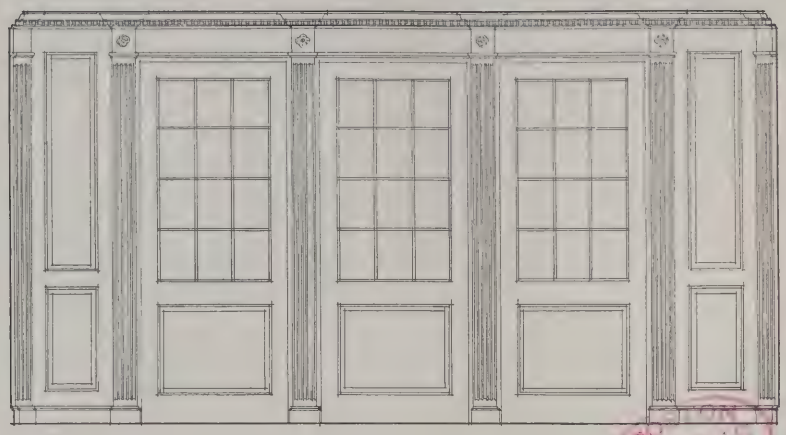
HOUSE OF MRS. PHILIP ROBERTS, FARMINGTON, CONN.

LEIGH FRENCH, JR., ARCHITECT

Details on Pages 414, 415.

LIVING ROOM, HOUSE OF MRS. PHILIP ROBERTS, FARMINGTON, CONN.

LEIGH FRENCH, JR., ARCHITECT



ELEVATION OF EAST WALL

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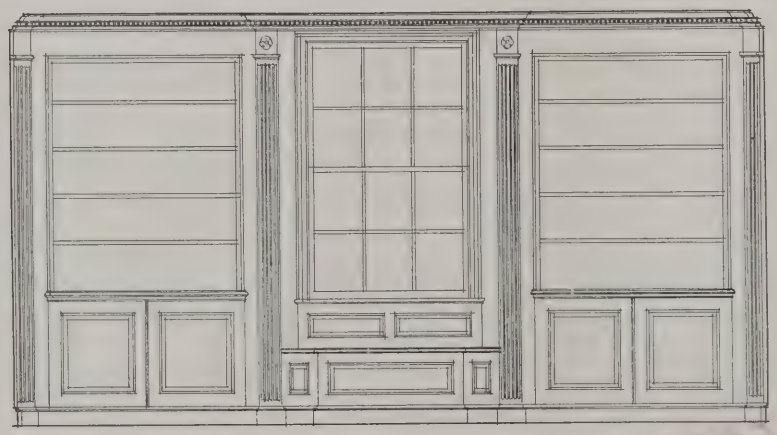

ELEVATION OF WEST WALL

SCALE
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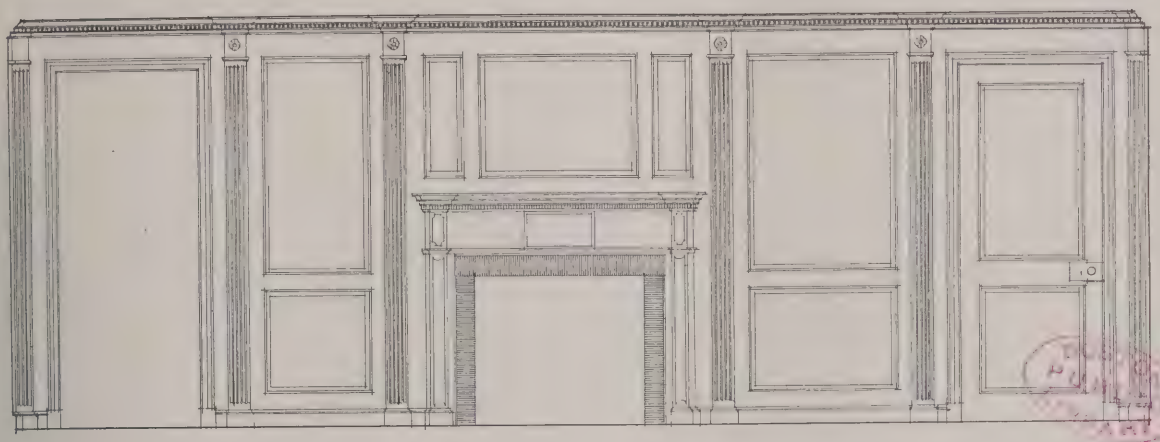
MEASURED DETAILS OF THE LIVING ROOM
HOUSE OF MRS. PHILIP ROBERTS, FARMINGTON, CONN.
LEIGH FRENCH, JR., ARCHITECT



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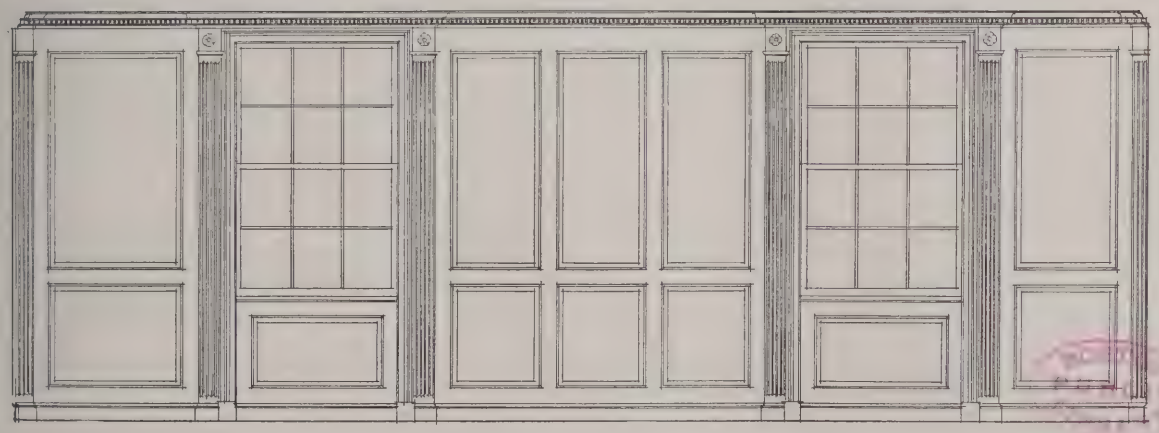

ELEVATION OF SOUTH WALL

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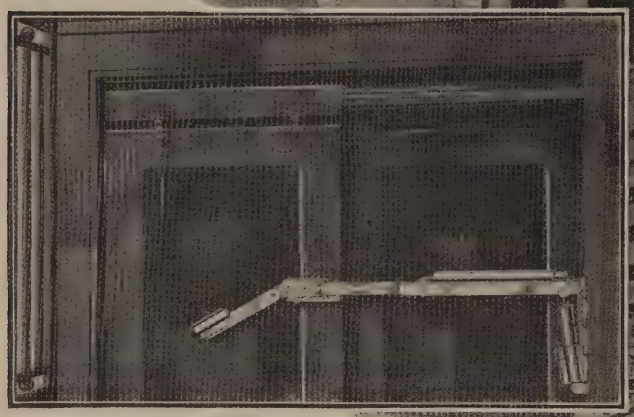

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BOOK DEPARTMENT

KITCHEN MANAGEMENT

Reviewed by
C. W. SPENCER

THE ever-increasing tendency among Americans toward living and eating in groups in such places as hotels, restaurants and cafeterias has produced a tremendous business in the sale of prepared foods, and it has become highly important that everyone concerned in any way with this enterprise should study it in a careful and scientific manner. Any architect who expects to be concerned with the designing of such buildings should be thoroughly conversant with the workings of a kitchen organization, so as to be able to plan this portion of the structure in such a manner that it will function smoothly and with a minimum of cost, lost motion and waste. He must know the methods of doing the work so that he may properly provide for the sanitation and ventilation of this department and provide equipment that will safeguard the life and health of both employes and guests. Since about 21 per cent of all meals served in America are prepared in such kitchens, it will readily be seen how great the importance of the industry is and what an amount of waste can arise from poorly planned kitchens.

It is only recently that the subject of kitchen management has been placed on a scientific business basis, and the change from old, haphazard methods has resulted in the saving of untold millions of dollars. Being a new science, there has been little published material on the subject, and what improvement was made was attained slowly by actual experience. The men who were in a position to know best about such things were too busy or lacked the inclination to put their experiences in form to be used by the rest of the industry. J. O. Dahl, who has spent many years in hotel departments, both at the "back" of the house and "out front," has devoted a great deal of time to the investigation and study of kitchens in all classes of buildings in all parts of the country, and has published the results of his research in a volume entitled "Kitchen Management." The importance of the layout of kitchens and the great opportunity for their improvement are indicated by this author when he says that of all the several hundred kitchens in which he has worked or which he has studied, only 49 were over 90 per cent efficient in construction and layout. This applies to new as well as to old kitchens, and is due in many cases to the fact that kitchens were put into areas that were not originally designed for that purpose, and also to the fact that the kitchen is often laid out by someone who knows practically nothing about food service and preparation.

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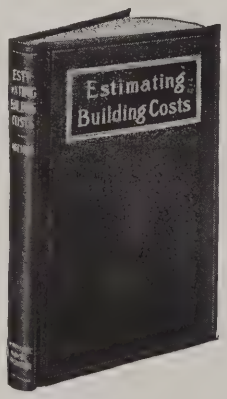

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Thus it is apparent that the kitchen should be carefully planned as to layout and equipment while the building is still "on paper," and that this should be done by an architect who has made himself thoroughly familiar with the processes of serving and preparing food and with the modern tendencies toward scientific management and use of up-to-date equipment.

The first 14 chapters of the book are directly concerned with the architect's problems and cover the planning of the modern kitchen as to its location, construction, flooring, walls and principles of efficiency. A chapter is devoted to the ideal pantry, and another to "Bakery and Butcher Shop Layout." The fourth chapter is on "Efficiency in the Storeroom." The dish- and silver-cleaning departments are described in the fifth chapter. Hospital and institutional architects will be especially interested in the chapter on "Diet and Service Kitchens," and "Transportation and Communication" present problems which should be studied by architects in all cases. Ventilation, modern refrigeration, and lighting are all subjects which are of great importance in securing maximum efficiency and production from the kitchen plant, and each is covered here in a chapter. Studies in fuel and power give much information and many suggestions in laying out electrical and cooking equipment, and three chapters are concerned with the various kinds of equipment and descriptions of various machines and devices that may be used in an up-to-date kitchen and for which space should be provided by the architect in making the layout.

At first thought it might seem that the remainder of the book, which is devoted to problems of actual management and kitchen routine, would not concern the architect, but if the architect is to give the best possible service to the owner or operator it is important that he be familiar with all the processes and operations that are to be carried out in the kitchen in order that he may be in a position to provide a plant that will be fitted in the highest degree to the purposes it is to serve. The book is interestingly written and is illustrated throughout with cuts from photographs, with plans, and with drawings, and in addition the appendix at the end of the volume has a large collection of plans showing successful layouts for kitchens in some of the leading hotels, restaurants, hospitals, clubs, and institutional and industrial buildings. One invaluable detail is the inclusion in the appendix of bibliographies concerning every phase of the problem.

KITCHEN MANAGEMENT. By J. O. Dahl. 364 pp., 6 x 9 ins. Price $5. Harper & Brothers, New York.

ARCHITECTURE. By A. L. N. Russell 266 pp., 5½ x 8 ins. Price $3. E. P. Dutton and Company, New York.

SO much of a technical nature has been written for the student of architecture, that the average individual is likely to think an understanding of the subject is almost beyond his reach. Mr. Russell in this book aims to break down the barriers of technicality and show in a simple way how the forms of buildings, or what we call the "historic styles," were evolved from the materials the people had at hand, the purpose of the building, or the conditions of the time. He also gives a picture of the gradual development, so that the reader may realize how one style is related to another. Due to the limi-

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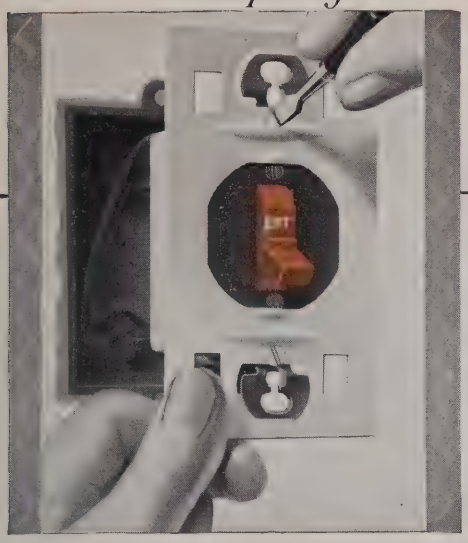

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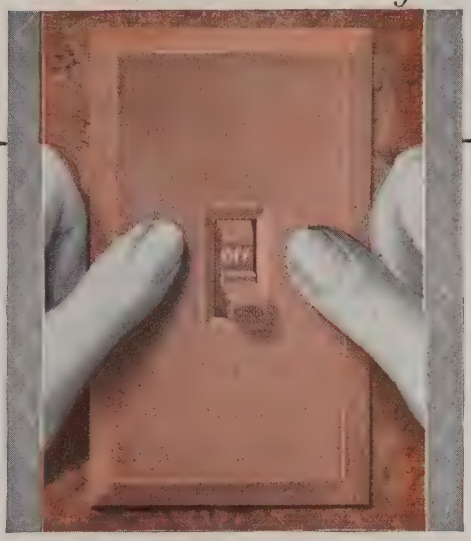

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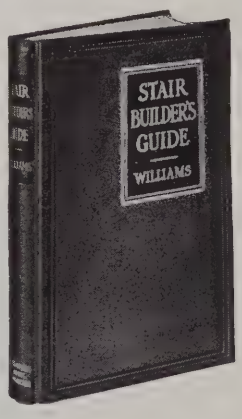

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tations of the size of the book, the text discusses only architecture in those countries and periods which have a direct influence on the architecture of western Europe. Building in Mesopotamia and Egypt are described in the opening chapters,—how the people developed their structures from the materials of the country, in Mesopotamia with mud, reeds, straw and palm leaves, while in Egypt, stone from the valley of the Nile was used. The early attempts with the "post and beam" and the arch did not make much headway, largely no doubt due to the climate, where it was always mild out of doors, and where any ceremonies which required a large space could be held in a courtyard. The Egyptians concerned themselves largely with tombs, and the architects who could conceive the pyramids and the government that could carry them out must have been more than capable. The pyramids are examples of great building, but probably not of great architecture; they are indeed triumphs of engineering.

The Greeks' great contribution to architecture was the founding of the "Greek orders," Doric, Ionic and Corinthian,—which are still used, almost in their original form, all over the world. Their buildings were "sermons in stone," which served as a reminder of Greek rules of life and conduct. Logic, balance and restraint, with the rhythm of proportionate parts running through all design, were qualities of the Greek ideal. They introduced all sorts of refinements in the design of a temple in order to correct certain optical illusions. After a building had been made as perfect as possible, it was enriched by sculpture, not merely as an applied ornament, for each piece was designed for its particular place in the whole scheme. The Parthenon, built in 438 B. C. still ranks as the most perfect building of all times. The Romans, once their interest in Greece was aroused, developed a passion for everything Greek. They borrowed the Greek orders, preferring the Corinthian, and developed it. The feature of Roman work which was to have an important effect on what came after was in the use of arches. Aside from the buildings, the streets were adorned with triumphal arches and gateways. We have today no buildings or institutions that can compare with the Roman baths. They included formal gardens, tennis courts, running tracks, open air theaters, accommodations for games and gymnastic exercises. In the center was the bath proper, with walls and floors of colored marble, and the ceilings decorated with paintings, mosaics and gilded bronze. The rooms contained statues, bronze screens, grilles and furniture of all sorts. There were private baths, lecture theaters, colonnades, where news of the day was read. Eleven aqueducts supplied Rome with water, and three are still in use today.

The structure of a Gothic cathedral is explained in detail by the author of this work,—how every portion of the structure is in constant action. The weight of the roofs, which is flung sideways by the thrusts of their vaults, is met by pressure in the opposite direction. The aisles and side chapels push against the nave and choir, while the thrusts too high for them to deal with are met by the zigzag of the flying buttresses. With the opening of the fifteenth century in Italy, the Gothic impulse had run its course, and then came the dawn of the Renaissance. The cathedral at Florence stood unfinished because no one knew how to roof an octagon 138 feet

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across. It remained for Brunelleschi to solve the problem by building a dome in two shells with massive buttresses to join them. The height was to be increased by raising the dome, resulting in a magnificent structure.

Inigo Jones returned to England from Italy full of Italian inspiration. His work meant the beginning of the English Renaissance. Another architect, Christopher Wren, designed St. Paul's and other churches and public buildings. With no precedent to work from, he conceived architectural effects new for that day. In houses, his work is called "Queen Anne." The eighteenth century received much inspiration from Rome. Architecture was taken up as a branch of scholarship, which resulted in artificiality and imitation of foreign styles. The four Adam brothers introduced the "Adam style" with its refinement and delicacy. They not only designed the house, but the furniture and fittings for it. The widespread knowledge of classical works and rules of proportion led to a high standard of taste. In France, the completion of the new facade which completed the palace of the Louvre, marked an architectural event, and the palaces and gardens built in the seventeenth century served as models for all Europe.

Dealing with architecture in America today, Mr. Russell points out our debt to McKim, Mead & White for showing us by their buildings that Italian Renaissance could supply the inspiration needed for the problem of modern building design. The very sizes of our structures helped architects to free themselves from superfluous decoration, which spoils so much modern work. The architect was forced to rely on proportion, shape, and mass of the building, the effect of light and shadow, and generally to work on broad lines. Due to present-day zoning laws, various new forms for the setback skyscraper suggest themselves to the architect, creating an interesting new development, which has endless possibilities.

MANHATTAN, THE MAGICAL ISLAND. 108 Pictures of Manhattan with Prelude and Descriptive Notes. By Ben Judah Lubschez. 8¾ x 12 ins. Price $15. Edition de Luxe, $30. Press of The American Institute of Architects, New York.

ALONG with the development which has brought photography to what seems to be almost perfection there has gone growth of good taste in its use. Photography ceased years ago, in fact, to consist merely in pointing a camera at something and then pressing a button, and there are many commercial photographers and hosts of gifted amateurs who have made of the making of photographs literally an art. Until one sees photographs of so many of them collected, it might not be realized that New York, notwithstanding its commercialism, possesses so many buildings which are beautiful, —beautiful individually and in themselves, that is, though scattered widely, for there are miles of dreary ugliness between St. Paul's Chapel or the fine old house at 7 State Street and the University Club on Fifth Avenue or the Washington Bridge far up town; but beauty exists, even though it be widely scattered. There is scarcely one of these 108 views which shows a structure not already well known, but the taste and skill shown in making the photographs supply ample justification for their publication.

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Cover Design: Mexican Architecture
From a Water Color by Edward A. Batt

The Editor's Forum — Page 37

"Cannon Ball House," Ridgefield, Conn.
From a Pencil Sketch by Frank A. Wallis, Frontispiece

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From a Photograph by Milo Alexander Guild, Frontispiece

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A COUNTRY HOUSE IN THE MAKING

PHILIP RESNYK, ARCHITECT

THE
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FORUM

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NEW STRUCTURAL FEATURES OF THE COUNTRY HOUSE

BY
TYLER STEWART ROGERS

THE very nature of a country house project implies quality and permanency of construction as primary requisites. Clients build country houses usually as a luxury rather than as necessary shelter. They demand quality of construction in all details,—first, in order to reduce maintenance and depreciation costs, and, secondly, in order to protect the costly furnishings and decorations which the houses usually contain. Whatever the architectural style may be, and whatever attention is paid to decorative elements, the structural framework must possess qualities of strength, durability, resistance to the action of time and weather, and usually a considerable measure of resistance to fire.

In this article we shall give consideration to the structure of the country house primarily from the point of view of the changes and improvements which have become possible through use of modern materials and methods of construction and the changing trend in design influenced by these factors, rather than merely summarize the structural features in the manner of a check list of elements which require consideration by the architect and owner. Looking at the problem from this angle opens up some very interesting matters for discussion, for in spite of the general impression that there is little new in the way of structural materials, the fact remains that the last decade,—and in fact the last two or three years,—have witnessed some important new developments which are definitely influencing the structural design of country homes. In this discussion it is impracticable to treat of the relative merits of various structural systems and materials, because individual factors surrounding each project, including the availability of materials, the topography of the site, the shape and size of the structure, its architectural style, and the type of exterior wall surfaces and roofing materials to be employed, all influence,—in fact may govern,—the choice of structural elements. It is quite sufficient, therefore, to mention the materials and structural systems adaptable to country house architecture, discussing only their individual merits and characteristics and leaving the choice entirely to the architect.

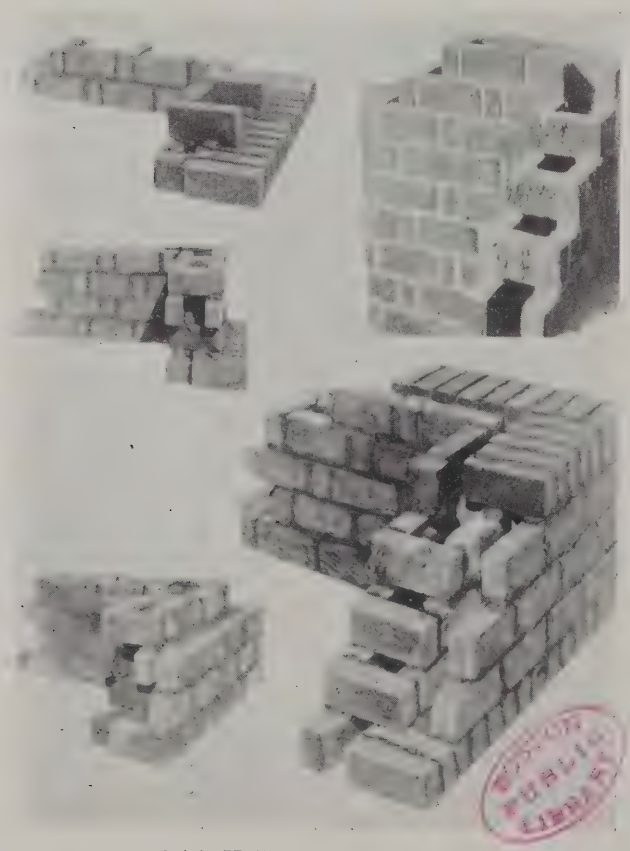
Foundation Materials and Sub-surface Construction. The usual foundation materials,—local stone, brick, reinforced concrete and concrete blocks,—have undergone little change for many years. The choice between these materials is almost wholly governed by local factors, for each of them is fully adequate for the purpose and produces foundations of ample strength and permanency; nor is it necessary to discuss materials for footings, including piling and mass or reinforced concrete, for these materials are employed in accordance with the load-bearing capacity of the soil. A relatively new factor worthy of attention is the development of basement areas for service and secondary living accommodations. Heretofore sub-surface space has been largely neglected, and basements have been provided under entire structures simply on the old theory that they were necessary to keep the ground floors dry and warm. They have been utilized solely for heating plants, fuel and other types of storage, and some of the less-used service functions. Today, the great volume of hitherto wasted basement area has been developed for practical usage of many types, from secondary living rooms and recreation rooms to highly developed service areas, such as fully equipped laundries, storage vaults, and spaces for the accommodation of mechanical equipment such as automatic refrigerating plants, water supply pumps, water softeners and purifiers and highly developed heating and ventilating plants with automatic stokers or oil or gas burners.

This trend has brought about the necessity for absolutely waterproof construction of basement walls and floors. Drainage of the foundations and footings merits first attention and should never be neglected wherever there is a satisfactory outfall for the drainage lines which are laid just outside of the footings, somewhat below basement grade. In a level country, and where heavy soil conditions make this method of protection unsatisfactory, the walls and floors must be made watertight through the use of membrane coatings on the exteriors of the walls or through the employment of some of the relatively new integral waterproofing compounds employed in the cement mixtures in reinforced concrete construction or in a cement mortar coat on the exterior or interior surfaces of stone, brick, or concrete block foundation walls. Going one step further, the utili-

zation of certain parts of the basement for living purposes requires that some means be employed to overcome condensation on the masonry foundation walls. This may be accomplished by introducing an air space near the inner surface or by furring out the inner wall and applying plaster to a suitable base which can withstand the effect of moisture without deterioration.

One method which has been successfully used to prevent the collection of condensate on the floors in basements is worth describing. When the walls are completed and before the concrete floor is laid, a board about 1 inch thick is laid completely around the walls at floor grade and the finished floor is poured up to this board with a pitch from the center of the floor to the walls in all directions. After the floor has hardened, the boards are removed, leaving a 1-inch channel into which any water which may condense on the walls or the floor finds its way. The outside drainage lines at the level of the footings take care of this water as it seeps through.

Structural Frame. There are five basic types of structural framing adaptable to country house problems. The first employs wood members throughout, using either dimension lumber in an ordinary manner with solid corner posts and studs or employing old-time timber framing of heavy, solid, structural members. The second type employs masonry walls of stone, brick, hollow tile, or cement block, with or without an exterior facing in the form of a veneer, and with structural floors of wood or steel members or of reinforced concrete. The third type, deserving a separate classification, involves the use of reinforced concrete for the structural frame, and the fourth employs structural steel fireproofed with stone or cinder concrete and faced with veneered walls or masonry walls of non-load-bearing character. The fifth type, which is just now being developed to the point where it may be considered a definitely established method of construction, employs a light steel framework throughout, distinguished from the structural steel frame by the use of what may be termed steel studs, functioning like wood studs in ordinary wood frame construction and by the omission of masonry fireproofing for each steel member.



Brick Hollow-wall Construction

Several new developments have occurred which pertain to structural framing and are worthy of special notice. Looking a little into the future, wood frame construction may soon take on new importance through the development of a successful chemical treatment of relatively low cost which makes wood highly moisture-resistant and which protects it from rot and the attacks of insects, including termites or white ants. This new treatment, which is something more than merely preservative, is an absorption process that may be applied to structural members as well as to finishing woodwork, including trim, doors, windows and window frames, flooring, paneling, and similar elements. It is interesting to consider the possibility of applying this treatment to genuine half-timber construction, for if the structural members can be made free from expansion and shrinkage, warping and twisting due to the absorption of moisture and subsequent drying out, it will be possible to use masonry fillers and stucco between exposed half-timbers or solid timbers and still have a weathertight wall at all times. This matter is still so new that the application of the chemical treatment for this purpose is yet to be tried out; nevertheless, tests already conducted are so satisfactory as to make the suggestion worthy of consideration where genuine timber framing in the old manner is desired.

The only other really new development in structural framework is the light steel frame already mentioned. Rolled steel shapes of relatively light weight are used for intermediate studs with light weight structural steel corner posts, beams and girders. The elements are usually bolted together after being cut and fabricated in standard units under shop conditions. Field welding of the structural frame is also being used and will undoubtedly be an important factor in this type of construction. The erection of this frame is exceedingly rapid, once the foundations are ready and the material arrives on the ground. Steel may be used for every structural member including walls, floors, major interior partitions and roof. The exterior of the framework usually consists of a coat of stucco applied over metal lath or a special stucco reinforcing base which has a waterproof backing attached to welded wire mesh. The stucco coat may constitute

the exterior finish or it may be used as a backing for a veneer of stone or brick. The interior face of the steel members is plastered over a similar reinforcing plaster base, leaving the steel framework protected on both sides by a highly fire-resistant wall. Structural use of this system promises a number of advantages, including permanency, a high degree of fire resistance, ease and speed of erection, and probably lower cost than reinforced concrete construction, fireproofed structural steel framing, and possibly lower cost than heavy, solid, masonry walls.

Types of Structural Floors. The common use of wood joists for structural floors needs no mention, nor is there need for an extended discussion of the use of structural steel and reinforced concrete in their various systems, for no changes have taken place in the employment of these materials recently. The only important new development in floor construction has been the successful introduction of steel joists as floor members, a matter fully discussed in an article appearing in the April, 1928 issue of THE ARCHITECTURAL FORUM. This type of floor, employing light steel joists laid on structural steel framework or masonry bearing walls and having a thin concrete structural slab above and a metal lath and plaster ceiling below, is particularly well adapted to country house construction where a high degree of fire resistance is desired. The cost of this method of floor construction is relatively low. It is undoubtedly the least expensive type of fireproof construction.

In country house work architects are frequently faced with the problem of developing really soundproof floors to separate sleeping quarters from the living rooms below, so that guests may not be disturbed by entertainments and social activities after they have retired. Practically no floor construction is entirely soundproof unless there is a physical separation between the lower and upper surfaces of the floor, for it has been proved that practically all structural materials transmit sound vibrations from one surface to the other and that only an air space between two separate surfaces is wholly effective. This type of construction can be economically accomplished with steel joists in this manner. The structural floor above is built in the usual way, spacing steel joists at the proper distance to provide adequate load-bearing capacity. Between alternate joists a second set of steel joists is installed in such a position that their lower chords are approximately 1 inch below the level of the lower chords of the trusses supporting the floor. To these wider-spaced secondary steel joists the metal lath and plaster ceiling are applied, using furring channels if necessary. An intermediate layer of sound-deadening material of soft, flexible type may be installed if desired to form a continuous layer running under the lower chords of the floor joists and over the upper chords of the ceiling supports. In this way the ceiling is independent of the floor above, and sound transmission may be entirely eliminated, because vibrations from the floor above cannot be directly transmitted to the ceiling below, nor can there be a reverse action. Wood joists have been successfully used in this system of staggering the joists and using the upper set to support the floor and the lower, separate set for the ceiling.

Whether or not fireproof construction is used throughout the house, there is a marked tendency today to make the first floor over the basement fireproof, because it has been well established that the great majority of fires in residences originate in connection with the furnaces or in fuel storage spaces. Steel joist construction may be employed advantageously in conjunction with wood frame for the rest of the building. Light reinforced concrete first floor construction is being used in many instances to prevent the possible spreading of basement fires. This tendency to use fireproof construction for floors has introduced another problem of use of finished flooring materials that may be applied over a concrete base. Several new developments in this field are worthy of special mention. Where wood finished floors are desired, two systems may be employed. The first and newest is the use of chemically treated wood floor blocks laid in a plastic cement directly over the concrete structural slab to form parquetry effects in genuine hardwoods, such as are frequently desired. The same chemical treatment which has been mentioned in connection with wood framing assures a permanent wood floor not subject to warping, shrinkage, and cupping. This type of floor can usually be laid more rapidly than strip or

Brick Veneer Over Cement Tile

narrow faced hardwood flooring and is undoubtedly the most economical type of wood floor over a concrete base. Where strip flooring or wide plank flooring is desired over concrete, sleepers may be introduced into the structural concrete slab in light steel joist construction, or they may be applied over the structural concrete floor in reinforced concrete and steel frame construction, using a cinder concrete fill between the sleepers or various types of sleeper-clips without fill. Here the chemically treated flooring possesses many advantages in economy, rapidity of laying and freedom from defects encountered in untreated hardwoods when laid over concrete and subjected to the moisture and condensation always apparent in a concrete slab.

Concrete floors may be finished with various types of hardeners to eliminate dustiness, and to give the floors more pleasing colors. They are also particularly amenable to surfacing with tile, stones of various types such as slate, marble, Caen stone, and similar materials, artificial stones, and resilient composition flooring materials, including cork and rubber compositions. The latter materials have come into wide use, not as substitutes but as floorings of distinctive character, possessing qualities not found in other materials. Rubber compositions are usually laid in tile form directly over the concrete base, employing special cements developed for the purpose.

One detail must be noted,—that the use of these cements demands a perfectly dry concrete floor to get permanent adhesion. Cork composition flooring includes cork composition tile and linoleum in sheet forms. These materials have been so perfected that they may be utilized in any part of a house, and they possess to a high degree, like rubber compositions, great resilience and comfort under foot, and marked durability. Cork composition tiles and linoleum are also laid in a plastic cement over the concrete slab, and the same precautions should be taken to have the slab thoroughly dry. Both cork and rubber composition materials are available in many colors and in variegated forms resembling marbles, and they can be used effectively to introduce color and pattern in flooring. The preparation of the concrete structural slab to receive these materals is inexpensive, consisting of securing a smooth, level surface in the slab itself without the usual granolithic finish and expensive troweling and floating.

Wall Construction. Mention has already been made of the newest type of wall construction involving the use of stucco and brick or stone veneers over a steel frame. There has been a marked trend within recent years toward the use of combinations of masonry materials as compared with the former predominance of solid masonry walls of one substance, such as brick or stone. The advantage, if any, has been that of lower cost, for there is probably no wall superior to a well built solid brick wall or one of well laid stone,—at least from a purely structural point of view. Relatively new materials, including hollow clay tile, stone and cinder concrete blocks, have come into quite general use. Clay tile has been developed in certain forms which permit its use as a facing material, but more often it is employed as a structural material with either a brick or stucco facing. Concrete blocks have also been successfully used alone by employing those having a specially prepared face, but more frequently they are employed as a backing material for a veneer of stone or brick or for a coating of stucco. Cinder concrete blocks are coming into general use in certain territories where their production has been developed, but their porous nature adapts them more particularly as a backing material, and they are rarely or never used without a supplementary facing.

It has now become universal practice in better quality construction to dampproof all types of masonry walls. The thinner the wall the greater the necessity for this treatment, for it is now known that driving rains will eventually penetrate masonry walls up to 12 inches in thickness, due to the porous nature of the mortar joints and sometimes of the masonry material itself. It has also become standard practice to furr out the inside surfaces of all masonry walls for two reasons,—one, because of the natural condensation of moisture on the inner surface, and, secondly, for the insulating value of the air space. There really is a third reason also,—that of sound absorption, for it is proved that plastering directly on a hard masonry wall creates unpleasant acoustical conditions that are very difficult to overcome.

Insulation has been receiving a great deal of attention within recent years, and many new materials have been introduced which are designed to eliminate or lessen heat losses. Old theories have been upset by tests, and ample proof has been developed indicating the effectiveness and value of an adequate layer of efficient insulating material within the walls. These materials are of four basic types:

1. Board forms, consisting of fibrous or porous materials compressed into sheets.
2. Mineral and vegetable fibre in flexible sheets.
3. Mineral and vegetable fibers or powders used in loose form and poured or lightly packed between the structural wall and the inner plaster surface or between floor joists for floor and ceiling installation.
4. Solid mineral insulators which are cast in place, consisting of powders which when mixed with water are poured into the wall or floor spaces, where they set in a highly porous form.

The use of these insulating mediums is usually worth while in country houses, for their effectiveness is great enough to offset their relatively low cost even when employed in high quality construction. Mention might also be made of the growing use of veneer construction over wood frames, consisting of brick, stone, or stucco. In this system the wood frame is designed to carry all loads and is arranged to take care of normal expansion and contraction of wood members in a uniform manner in order to obviate development of cracks in the plaster walls after the house is completed. The veneer has no

load-bearing function and simply becomes a decorative and protective element. When wood floor joists are used with solid masonry walls, there is tendency for the floor members to shrink as they dry out, and there is also a marked tendency for interior bearing partitions made of wood members to shrink, causing a development of plaster cracks along ceiling lines adjacent to the masonry exterior walls (which do not shrink in a similar manner). This is another difficulty that is overcome by using light steel and concrete as structural materials which are worthy of special attention in the development of country homes.

Veneer construction over both wood frame and in conjunction with structural masonry materials has grown in popularity primarily because of its relatively low cost. No limitation is imposed upon design features by the use of veneer. Common brick is extensively used to get Old World texture effects, and all types of bond can be developed without difficulty in a veneer wall, including Flemish bond and the so-called "skintled" brickwork. Face brick is almost always employed as a veneer, backed either by common brick or other masonry materials, or it may be employed over the sheathing of a wood frame. Stucco is in itself a veneering material, and its use is so well established that no special mention is necessary. Cut stone—particularly limestone—is now manufactured in relatively thin slabs for veneer construction of fine residences.

Interior Walls. Along with the trend toward use of fireproof construction has come increased attention to the use of fireproof partitions within the country home. The types commonly employed in fireproof commercial and industrial buildings are adaptable to residential construction where the supporting framework is adequate to carry the dead load which they impose. Common brick may be employed for a 4-inch wall over moderate spans and for reasonable ceiling heights and will take plaster directly on both sides without furring. Hollow tile has been extensively used in this manner, and gypsum block because of its lighter weight is highly suitable.

Where interior partitions are made of wood or metal studs, fireproof construction demands the use of some type of metal lath as a plaster base. Wood lath is not used as much as formerly for quality construction, and its place has been taken by metal plaster bases and to a certain extent by various types of plaster board. The latter type of material has grown in use for moderate-cost homes, but where expensive decorations are to be applied over the plaster, architects have shown definite preference for metal lath and wire mesh because of the mechanical bond they provide and because of their function as a plaster reinforcement as compared with the simple adhesion of plaster to wall boards. Another new material, recently developed, is a form of plaster finish especially designed for application over wall boards and insulating boards. While this material is a finishing material and for that reason is outside of the scope of this article, its use is designed to permit the employment of plaster boards and insulating boards for interior wall construction to a greater extent than has heretofor proved practicable. Tests indicate that this new plaster finish has successfully solved this long-standing problem.

In country house development there is need for soundproof walls as well as soundproof floors in certain areas. Much attention has been devoted to this subject in recent years, and some progress has been made. There has been a tendency to advocate the use of insulating materials for soundproofing purposes, but this is sometimes only partially effective if there is a physical connection in the form of a stud between the two adjacent wall surfaces. It is found that the wall moves as a whole, functioning as a vibrating diaphragm, and that filling the air spaces with a soft and porous material goes only part of the way toward the desired end. The ideal construction involves a double set of studs in staggered position with one wall surface applied to the first set and the other wall surface to the second set. Another way of solving this problem is by the use of a solid and substantial wall, such as brick, tile, or gypsum block and employing a soft plaster on either face. Under this plan reliance is placed upon both the sound-absorbing qualities of the soft lime plaster and the rigidity of the wall core. A third method of soundproofing,—which is applicable to ceilings as well as walls,—involves the employment of certain new materials developed for their acoustical and sound-absorbing properties. One type that has been long used with a high degree of success for correcting acoustical defects in auditoriums, theaters, restaurants and hospitals, consists of a thick layer of hair felt with a fabric coating upon which decorations may be applied as over plaster. This material is soft to the touch and for that reason is not extensively used for wall surfaces, above a wainscot of reasonable height. Nevertheless, its employment in this manner for the upper wall surfaces and for the entire ceiling area is effective in absorbing sound, so that little or none is transmitted through the wall or the floor above.

Other acoustical materials of a harder type, consisting of compressed and felted fibers, may also be employed for soundproofing purposes. Their effectiveness is based upon the principle of absorbing the sound within the space in which it originates, as in the case of soft lime plasters. The attention that has been paid to insulating exterior walls and roofs against passage of heat has called attention to the advantage of insulating some interior walls between rooms where a considerable difference of temperature may be maintained during part of the day. This occurs, for example, between dressing rooms which are kept warm during the night and bedrooms or sleeping porches in which the windows are thrown open even during extremely cold weather. It also occurs between various types of storage rooms in the basement, in unheated fur closets and similar units.

Roof Construction. Considered in its structural

aspects, there has been little development in roof construction except the introduction of steel to a greater degree. Steel members are handled like any other type of structural members and are adaptable to hip and pitch as well as to flat roofs. They are obtainable with wood nailing strips attached to the top chords to facilitate the employment of a plank roof surface, or they may receive a thin reinforced concrete slab, as in the case of fireproof floors. The general employment of tile, slate, and other heavy roofing materials calls for special attention to the load-bearing capacity of roof members and to their rigid bracing. As all of these materials, as well as composition and wood shingles, are almost universally attached with nails to the roof surface, the employment of wood planks even in otherwise fireproof construction is commonly followed. However, sleepers can be installed in a concrete slab as in the case of floor construction, if desired, and these sleepers in turn carry the necessary nailing strips to which the roofing material may be conveniently attached. Here again insulation has become an important factor, for it is now known that a considerable percentage of the total heat lost from a building passes through the roof, and conversely that the heat of summer suns drives down through most roof surfaces and makes attics and upper bedroom floors almost uninhabitable in extreme weather. Where there is an unused attic, insulation is frequently employed in the ceiling of the upper floor, using insulating substances in loose form, such as fine powders or gypsum or fibrous materials that can be packed lightly between the attic floor joists. Where the attic space is used for servants' rooms, recreation space or other living purposes, it is essential that this insulating material be made a part of the roof structure itself.

Many of the relatively new materials that have been mentioned in this summary were primarily developed for use in other type of buildings, and their adaptation to country house planning has frequently been quite slow. This indicates the importance of being constantly familiar with new materials and new methods in order that the architect's office may be prepared to bring to its country house clients all the advantages which modern developments offer.

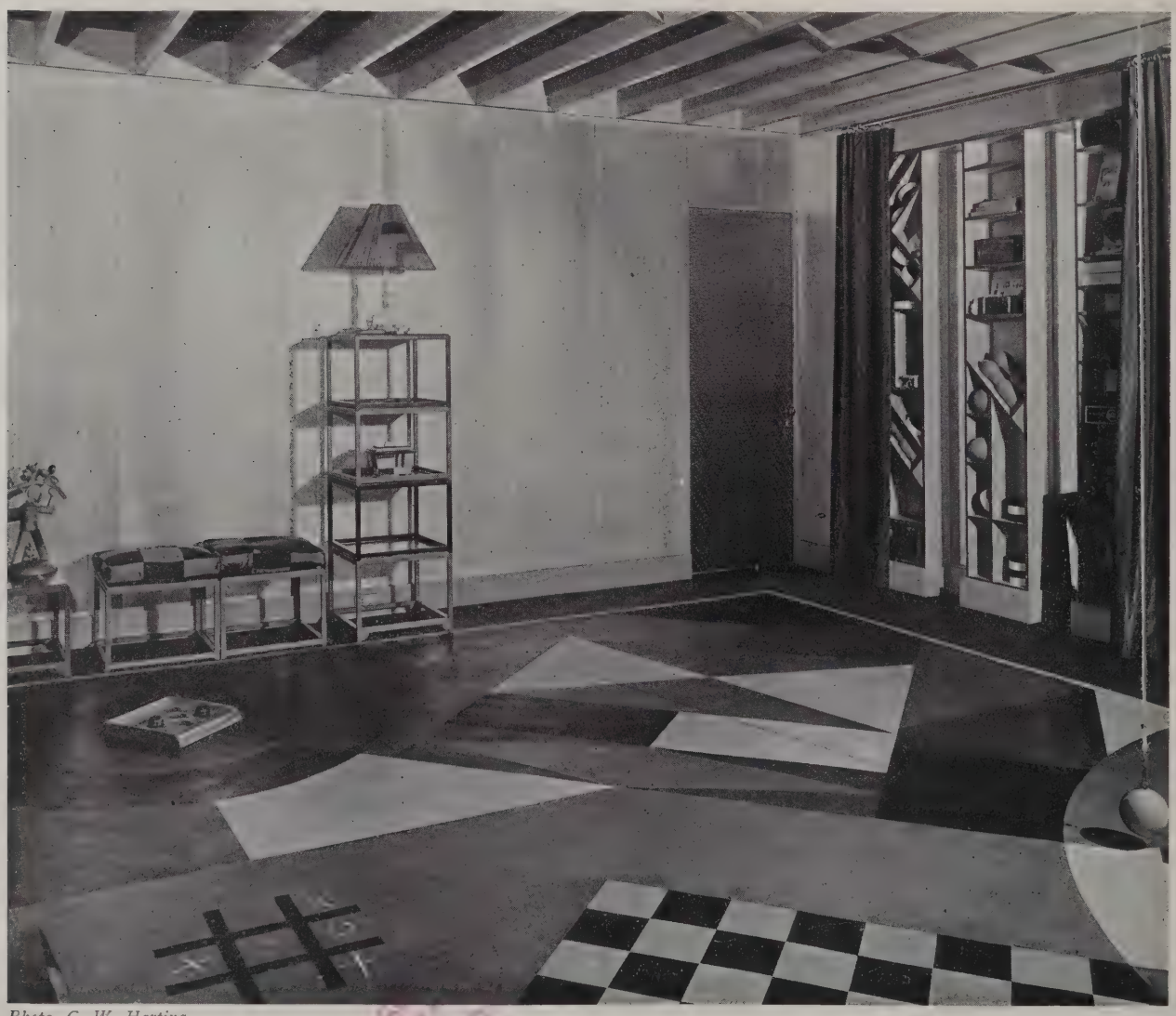


Photo. G. W. Harting

Game Room Floor of Inlaid Linoleum Over Concrete

MATERIALS FOR THE INTERIOR FINISH OF THE COUNTRY HOUSE

BY
PENROSE V. STOUT
ARCHITECT

IN the earliest days, primitive man built himself a shelter to protect him from the vagaries of the weather and from the attacks of his enemies. As man has developed, the purpose of his house has become more complex, and civilized man must have beauty as well as comfort in his immediate surroundings. The interior of the house has become as important as the exterior. How is this beauty to be obtained? In approaching this problem the architect is faced by two primary considerations,—the personal and the economic factors. The atmosphere of the house must be in keeping with the manner of life of its owner. The stage must be set with thought of the action,—shall it be a simple setting for real rural existence, the broad hearthstone and a self-contained life, or shall the style of the house reflect a grander style of living and form a background for social gaiety and a great complexity of interests? The economic factor determines important limits and chains the flights of fancy to solid earth. Limits are great blessings. Without limits, design is impossible, and in the absence of real limitations, the artist is forced to create his own. In architecture, as in every other field of art, it is not the cost of the object which makes it beautiful. The simple, inexpensive house may be, inside and out, as complete and charming an entity as the most pretentious.

It is very important to distribute the building appropriation thoughtfully among the various rooms. The main living rooms which have most use should have proportionately more spent on them. Necessary economies may be cleverly made in less used rooms. This does not mean lack of consistency throughout the house. If the appropriation is small, the materials should be inexpensive and the treatment should be simple throughout. The problem of interior work should be approached with one question in mind,—how can the greatest beauty and adequacy be attained without the sacrifice of simplicity? The artist with Spartan fortitude should bravely eliminate every unmeaning detail. The value of successful country house architecture is not so much in its immediate appeal as in its lasting qualities of beauty. The test comes with time, and it is important that time should find both design and material good. To know well the good work of the past and how to interpret it in terms of modern life with modern means is the work of the architect. The so-called "modern" movement in art, revolting as it does against precedents, has caused much interest and agitation. It is an effort to express modern life, and as such it has much merit for the architect. The new art should not be shunned nor should it be unreservedly embraced. The wise designer will find much of value in the new ideas, but he will not discard the invaluable heritage of the past. A healthy growth in art, as in nature, must come through evolution rather than revolution.

In the earliest days, the architect could use only the direct products of nature,—wood and stone,—and he was further limited, by lack of transportation, to the use of the kind of wood and the kind of stone in the vicinity. Later, the magic of transportation made the natural products of the whole world available to those rich enough to buy them. But never has the architect enjoyed such freedom of choice as at present. He has at hand an almost unbounded variety of materials with which to realize his vision. Science and manufacture have combined to refine the ancient products and to create a wealth of new materials. This vast array of riches brings its own dangers, and the temptation to use too many different finishes is ever present. Too great differentiation makes for restlessness and confusion, and the greatly desired simplicity is sacrificed. Too wide a diversity

Photos. Nyholm

This simple painted wood paneling is well proportioned for the low ceilinged library

American pictorial wallpaper adds interest and a sense of spaciousness to this dining room

Photos. Nyholm

The painted woodwork of this living room is carefully studied. The delicate carving is emphasized by a light glazing coat, wiped off. Facing and hearth are marble

The contrasts are here reversed. Stained walnut is used for the wall, and the marble facing of a lighter brown reflects the background colors of the painting above

in color and finish should be avoided in rooms which have a physical kinship,—for instance, living and dining rooms which open into each other in smaller country houses. If these rooms are finished in different styles or materials, the scale of the house is diminished. Treated alike, they tie together and the house seems larger. Difference in sizes and shapes, in hangings and furniture will give each room its own individuality while preserving unity of scale.

Plaster. When primitive man first needed something to hold the stones of his hut together, he used mud for cement, and ever since that time man has been perfecting his binding compound. He next used it for filling up the cracks and making the inside of his house smooth. As he developed and began to think of beauty as well as of necessity, he used plaster, decorated and in relief, for his ornamentation. He was forced to mix his own compound and often made mistakes, but today we have perfected and standardized products which give dependable results. No matter how good this plaster product, it is wasted on an improper foundation. It is no economy to save on the lathing. The best lath is a necessity for permanent plasterwork and goes a long way toward eliminating the cracks which disfigure walls.

For ornamental purposes, plaster may be modeled on the surface itself, or the decoration may be pre-cast and the finished plaster worked to it. The admirable parging of the early English homes was worked directly on the wall or ceiling, and the background plaster was worked as smooth as possible on the wall, using the palm of the hand. It is expedient today to have the ornament pre-cast on burlap sheets and applied to the wall. To avoid any doubt of the result, it is possible to obtain hand-finished plaster, also cast on burlap. This soft, smooth and irregular surface can be shellacked and glazed with excellent effect and makes a perfect background for old furniture and hangings. Plain plaster cornices are better run directly in place. If ornamented, it is better to have them pre-cast and laid up in sections. In houses where the softness of old hand-finished plaster is desired, and economy is necessary, it can be closely approximated by using textured plaster or composition materials, applied with a trowel and wet brush or with the brush alone.

There is a wide variety of other effects of texture and color which may be obtained by the studied use of these materials. They lend themselves to being modeled on the wall and afford a good base for glaz-

Palm-finished plaster is here used appropriately. The peacocks worked in flat relief were designed to help frame the portrait above the fireplace

This fireplace is of old roofing tile which, laid herring-bone, forms an interesting pattern. The carving on the oak lintel enriches the fireplace

ing. Color may be mixed in, and painting and stenciling done in relief. These finishes should be applied with a smooth, inviting surface, and the wall should never be left, as it often is, with sharp, forbidding projections. These rough-textured surfaces should not be used indiscriminately. Because of their novelty and cheapness, there is a prevalent tendency to use them in unsuitable places. A room in a simple Georgian type house, which would be dignified and charming with plain painted walls, is garish and exaggerated with heavy textured composition. It is well to observe that the most prevalent cause of annoying wall cracks in plaster is too quick drying. The room should be kept practically closed for a week after each coat, to insure its proper set. Sgraffito, used extensively in Hollywood, is a most interesting, permanent and inexpensive means of decoration. Thin layers of cement or plaster in contrasting colors are applied one over the other, and before it receives its final set, the design is scratched on. If the top surface only is scratched through, the color of the undercoat shows, and if this undercoat is scratched in places, the color of the next coat appears in the design. The fact that sgraffito is an Italian name for a process formerly used in Italy extensively, is no reason why the process should be limited to the expression of Italian ornament exclusively. If the character of the design conforms to the spirit of the room, it might well be adapted to almost any style with great interest and charm.

Wood, formerly one of the primaries of construction, is still the architects' greatest friend. In its variety and adaptability it is unexcelled as a medium of decorative and structural expression, and it supplies the essence of beauty in many a room. With its richness, softness, and mellowness, it has no equal for the intimate sitting room or library. It is the perfect frame for tapestries, or panels of exquisite needlework or for shelves of vari-colored books. Moulded by machine or carved by hand, it has a direct and irresistible appeal. Here again fittness to the particular problem in hand must determine the kind of wood and its design. Pine is too humble to frame rare tapestry in a stately hall, but properly treated it offers a soft and friendly background for rooms less formal. It is most satisfactory when selected for wide-flowing grain and small, tight knots. It appears best when mellowed by age or lightly stained and waxed. The pine room has recently become a fad; no house seems to be complete without one.

Photos. Nyholm

Vertical pine boards with moulded edges frame this simple and appropriate mantel

Hand-hewn timbers in this carpenter-built staircase express ruggedness and simplicity

There is no good reason for this monotony, since many other woods are as beautiful, as readily available, and often more appropriate in the setting. Oregon cedar is easily worked, is of very good color, and is usually less expensive than white pine. Chestnut, although rapidly disappearing from our forests, is still plentiful in the lumber yards. It has a beautiful grain and good working qualities. Oak, the old reliable, is medium priced and is essential for some period rooms. There are many, perhaps, less well known woods which have character and distinction of their own,—for instance butternut, cherry, birch, gum, and pecky cypress can be used with good effect at medium cost. Among the finer woods, walnut,—American, French and Circassian,—must be mentioned. Mahogany, often ruined heretofore with red stain and glossy varnish, is susceptible to most beautiful carving and is a fine, dense wood of decorative figure. There is good reason to believe that it will shortly have a new vogue with more sympathetic handling.

It is well to bear in mind that all large wood panels should be laminated to stand the expansion and contraction caused by our dry, heated houses. It is also important to heat a new house enough to dry out the walls before setting any wooden trim. Irreparable damage is frequently caused by the absorption of moisture by new woodwork in a house with plaster not properly cured. Wood which is to be painted should be easily worked and non-warping. Its grain must not rise, and any tendency for the sap to stain the paint should be retarded with shellac. Among the good woods for painting are varieties of white pine, soft pine and whitewood. In using random width plank flooring, highly satisfactory results have been obtained by using oak fumed in potash. This process gives the floor a uniform brown color, which prevails all the way through the wood. It therefore has less tendency to show wear than stained floors. Use of the process also obviates any tendency to swell or buckle.

Painting is a subject on which everyone considers himself an expert and in which everyone has dabbled at some time in his life. Although painting seems so simple, it is one of the chief efforts of an architect to obtain workmanship and materials of a consistently good character. It is no longer necessary or advisable to mix one's own paint. A skilled painter well trained in his trade may produce an excellent result with his own mixture, but there is no assurance that the same painter will be on the next contract. Thousands of dollars have been expended in the laboratories of manufacturers to perfect their paints and varnishes and to test their results. It is the part of wisdom to enjoy the benefits of their scientific research and to be assured of a consistently good product, thoroughly adapted to the case in hand. The architect thus can know beforehand the result of his specification. Labor is the chief item of cost in a paint operation, and it is important to buy quality paint rather than material made down to a price.

There is a product on the market for finishing

This floor is of waxed slate; the door of battened oak; the stair of polished black composition, and the walls of textured plaster

Here the floor is of black and white marble. The stairs are painted, the balusters of painted wrought iron with cast brass caps and bases

floors in two operations which gives a very desirable effect. After scraping and sanding, the floor receives one coat of this product. It is allowed to stand for about two hours, and the surface wiped off. After 24 hours the floor is polished, and thereafter maintained with wax, as usual. Where wear eventually shows in passages and at thresholds, a new application of this product very quickly corrects the damage. It has been found highly desirable for use in apartment houses where the floors have to be refinished for each new occupant. It has good color, transparency and finish; it has remarkable penetrating qualities, and is also a good preservative. It saves the laborious and expensive operation of clearing the floor to the natural wood and rebuilding the surface. The recent advent of quick-drying lacquers opens up new possibilities for good paint effects. Lacquer produces a tough, tenacious surface of good texture, and a feature of frequent importance is its quick-drying characteristic. It is not a cheap product, but this is largely compensated for by its good covering capacity. It is frequently applied with economy as a spray, where large and uninterrupted surfaces are to be finished. It will be found excellent for stencil work where several colors are used, and when it is costly and tedious to wait for the drying of one coat before the next is applied. For obtaining a natural wood finish, one of the larger paint manufacturers has recently presented a product which makes it possible to obtain a very good finish with two coats. The first coat is a stain and filler combined, of good body and transparency. It is necessary only to add the finish coat, whether this be of dull finish varnish or wax. It has been found that great economy can be thus obtained along with highly desirable effects.

Where means permit and a handsome paint finish is desired, it is wise to first cover plaster with muslin. This produces an excellent surface upon which to paint, and it prevents hair cracks from later marring the finish. When the walls themselves are to be decorative, rather than a background for other color and design, wallpaper plays its part. There is an endless variety of designs to choose from, and the result will be no better than the choice. The durability of paper may be increased and the color tones of many improved by the application of an especially prepared sizing recently perfected. If the paper is to be used in bathrooms, it should be sized with this preparation and given two coats of spar varnish. Paper treated this way is attractive for bathrooms, as decoration is practically limited to the wall surfaces. On bathroom walls, below the wainscot line, waterproof surfaces are imperative. The most economical treatment for the walls is the use of Keene's cement finished with a good grade of waterproof enamel. Where this is used, it is important to have a 2-inch strip of tile set flush with the plaster immediately above the bath tub or other horizontal projection which will need frequent washing, or the enamel will soon be worn away. Tile from floor to ceiling, or to wainscot height, in plain or contrasting colors, is well worth the added expenditure. Our bathrooms,

Sgraffito is used in this mantel in delightful harmony with its surroundings

An original use of wrought iron for trim. The arched soffits are stenciled

until recently gleaming white as snow houses, are now decorated with tile, heavy slabs of glass, marbles and mirrors, and made into shrines of luxury. Tile for the kitchen walls combines æsthetic pleasure with perfect cleanliness and saves constant repainting. It has long been used for bathroom floors and has proved its practical value, but only recently has thought been given to its use for color and design. It makes a highly appropriate floor for the breakfast room or loggia. Where a resilient floor surface is required, as in the working part of the house, linoleum or rubber, in sheet or tile, colored, embossed or marbleized, may be used to advantage. Long life and good appearance may be increased by waxing.

In stately rooms without carpets, floors of oak, walnut and teak are appropriate, and their richness may be enhanced by inlays of rare woods. Teak mellows and becomes rich and beautiful with age. Veneered floors of random-width oak are serviceable for rooms which are formal but less stately. Random-width oak planks, with wooden dowels, where cross-scraped, take on a softness of texture and an appearance of wear. This type of floor is becoming to the informal room. The charm of our early American farmhouse floors may be obtained with white pine in varying wide widths face-nailed with hand-wrought nails. They are charming when stained or painted. Now that comb-grained pine has increased in cost to that of oak, it seems wise to furnish oak floors for all bedrooms. Economy may be effected by using flooring with a predominance of short lengths, and in rooms where large rugs or carpets will be used, the short lengths may be distributed in the center and the long lengths used for the more exposed side sections. There is no thing more certain to cause trouble and annoyance after the completion of a house than floors which warp or shrink and expose cracks. It is a good principle, when floors are important, to have them furnished, laid and finished by a reputable flooring specialist, wherever one is available. The grace and elegance of marble for the stair hall has long been recognized, and it is unexcelled in an appropriate setting. For a Colonial hall, diagonal squares of Belgian black and a cream marble have given excellent results. Marble gives dignity to the mantel, and there is no other material which so adequately fulfills this function. It may be had in any color or graining to harmonize with the decorative scheme.

To gain familiarity with available materials, to study their characteristics and know something of their possibilities and their limitations is as essential to the architect as his historical study and æsthetic training. This familiarity stimulates the imagination. It is surprising to see the innumerable examples of excellent results that can be obtained with the simplest and least expensive materials when they are rightly used. The material that is used frankly for what it really is and for its own qualities is much to be preferred to one that is made to imitate something more expensive. The sham shows its shallowness, while the genuine grows old gracefully.

SANITATION OF THE COUNTRY HOUSE

BY

A. R. McGONEGAL

MEMBER AMERICAN SOCIETY OF SANITARY ENGINEERING

THE sanitary provisions in the country houses of today are receiving more and more attention. The living rooms, dining rooms and others may be designed in much the same way as they have been for the past five hundred years, but the bathroom, with its necessary conveniences, presents a comparatively new problem in design.

For comfort and convenience, each guest room should have a complete bathroom in addition to those provided for the master and mistress, although in quite large houses with an elastic guest list it may be deemed sufficient to provide a number of smaller rooms with a bath between each two. Servants, too, are critical people, and while it is not customary to supply private baths generally in the servants' quarters, it will be good policy to provide liberally for them. Many a well trained and otherwise desirable servant has been lost solely on account of insufficient or poor sanitary provisions. By reason of the different forms of service to be rendered, each of these types of bathrooms requires different fixture layouts, and as we are becoming educated beyond use of the stereotyped three fixtures in cold, white equipment, there is a selection of fixtures suitable for each, and we may fit and furnish each of our bathrooms in harmony with the chamber it serves.

The bath of the hostess comes first in consideration, and there is slight limit here on the designer's skill if the budget is elastic enough. One is no longer limited to the glaring white pottery of a decade ago for the fixture selection, as potters have learned the use of metallic coloring in glazes. Solid colors in blues, greens, and browns are obtainable, as well as many artistic shades to blend with almost any room's color scheme. Some potteries are also producing pleasing mottled effects, and much hand retouched, delicately veined ware has recently made its appearance. This colored ware is every bit as sanitary as the dead white; it does not show temporary dust, or interior fixture soiling, which it is not always possible to avoid, and it offers a relief from monotony by making possible the shifting of fixtures from room to room with each annual or periodical redecorating of interiors. Some manufacturers have recently placed on the market modern examples of the marble slab lavatories of a generation ago, beautiful to the eye when newly built of black and gold, or of delicately veined Etruscan marble or of onyx, but absorptive, nevertheless, and subject to possible failure where the parts are joined together. The veins in the marble pattern as well as the joints between the basin and slab may absorb water. Keeping pace with the advance in the art of pottery making, the brass worker now produces faucets, brackets, and metal trimmings in period designs, in two-color finishes, in all platings, and in widely varied selections. Chromium, cadmium, and other hard metals are now plated on so as to give a practically everlasting finish, and even gold and enamels are extensively used in pattern work. Some of the newer showings are colored by firing the harder finishes.

In the matter of wall and floor finish for master baths, we are somewhat similarly situated. Time was when finishing a bathroom meant simply using a more or less absorbent cold, white-glazed, earthenware, rectangular tile up to a height of 4 or 5 feet, with perhaps a colored stripe and a quarter-round nosing or ogee cap to finish, and a plain white or tinted enamel-painted wall above. Today, though we no longer use unvitrified material, we are still using tile for a waterproof finish, and we have a wide selection. Few if any other materials give at the same time such a practically non-absorbent wall and such an opportunity for pleasing design. Marble, though capable of fine effects, is too absorbent to be considered a fully sanitary material, and cast opaque glass, so much used a few years ago, was found to be subject to temperature cracks, and the joints could hardly be made permanently watertight. The manufacture of vitrified tile has advanced to a point where a non-absorbent, even product is the rule, and it is furnished in unglazed, mat or full-glazed finishes, and in practically any color or tint and in standard and special shapes. The use of faience and body tile in selected or random tints allows the designing ability of the architect full sway, and it makes possible the tiling of a bathroom that is in keeping with its purpose and at the same time inviting and restful to the user,—an architectural credit to the house, and yet thoroughly practical and water-tight. In the use of faience and special tiles it is usual to carry the tiling to 6 feet, 6 inches or 7 feet, or even to ceil the room over if so desired, and paving tiles in harmony with the wall work are used on the floor. Except in special cases, however, or in large bathrooms, tiling the ceiling has an oppressive visual effect and tends to accentuate small noises and splashings, and it will usually be found better practice to finish the upper parts of walls and the ceiling in some harmonious contrast in oil to give a lightening effect to the whole. Resilient floors of composition tiles, cork, linoleum and rubber are also frequently used in bathrooms, and they are made in many colors and designs, some in imitation of quarry tile or of marble.

Fixtures. In the matter of fixtures, the tub comes first, as it typifies the room. Some makers show free-standing tubs away from all walls, but perhaps as outweighing appearance there are the more diffi-

Photo. Keystone

A Commodious and Well Appointed Bathroom, Completely Tiled, Including a Built-in Shower Bath

cult plumbing connections to manage, and the two not unimportant considerations of occupancy of space which might better be given over to unobstructed room for dressing, and a wall for substantial attachment of handholds, to assist the bather into and out of the tub. Sometimes one is not as athletic as once, and perhaps not as slender, and a helping handhold is very gratefully appreciated. In the present state of the matter, enameled cast iron is a superior material for tubs, as vitrified earthenware, of which the other fixtures are made, usually cannot be had in such large pieces. This presents some difficulty in the use of colored fixtures, as the enamel on iron cannot always be made to match the metallic color glazes on the high-fired vitreous ware; but a solid tint can be selected in a built-in type which will harmonize with the slightly mottled tones of the rest; or what is perhaps best, a rim type with a lighter inside tint can be selected, and the ends and front can be blocked and tiled in with the same tiles and treatment as the rest of the room. The bottom and sides of the tub should be insulated from the floor and from the wall construction with mineral wool and rubber blocks or with other suitable water- and vermin-proof material to minimize the transmission of sound.

Showers. The wall type of tub lends itself most readily to use of the shower, especially if it be built into a recess, as a shower can be at shoulder height with a diagonal stream discharge. A shoulder-height shower permits a quick cold rinse after a tubbing without drenching the hair and getting water in the eyes, and it allows also a complete and comfortable hot or cold shower standing in the tub. If one wants to wet the hair, it is easy enough to bend over slightly. While the shoulder type does not splash as much as the overhead type, a curtain is still a necessity, and here again the recessed tub gives opportunity for a straight curtain rod across the recess. Rubberized silk curtains can be had in a sufficient variety of colors and patterns to harmonize with the room and its fittings, and an especially effective touch is to have towels of a tint that fits in with the color scheme of the room.

The shower fixture should be of the concealed piping type with a removable face, ball-joint rainhead, and an equalizing, non-scalding shower valve. One or two valves on the market have this equalizing feature built in, but it can be had as an added appliance on any shower valve equipment, and it prevents any change in temperature of delivered

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Decorations, Fixtures and Fittings May be of a Period Style as in this Modern Pompeian Bathroom

water after once setting, which might be caused by slight momentary variations in pressure between the hot and cold supply lines, due to temporary usage of one or the other elsewhere. So as to prevent occasionally leaving a cross connection between the hot and cold supplies, the operating handle of the non-scalding valve should be the only valve handle present in the bathroom, the control valves and the checks on the supplies being located in a closet or panel at the end. The handles of the mixing valve, the supply sprout for the tub, and the bath faucets can be had to match the basin faucets and other hardware in pattern and finish. The supply to the tub should be a spout from the wall and above the rim. Spouts through the sides or the ends of tubs and bell supplies may permit direct cross connection between the sewer and water supply, allowing body-waste water to get into the water supply.

Water Closets. Unfortunately, water closet bowls have never been designed so that they will give a satisfactory flush and at the same time be absolutely noiseless. The flushing efficiency of a closet depends on its siphonic action, and the breaking of that siphon occasions a slight "chug-chug" at the completion of operation. Several tank-operated closets on the market are, however, noiseless except for that one feature, and if the tank is objectionable in the room and out of harmony with the design, it can be placed in a closet opening from an adjoining room, and the flushing handle be extended through the wall. One make of noiseless closet has the tank and bowl all in one piece and has a distinct sanitary advantage,—that of air break in the supply line to prevent possibility of the contents of the bowl or tank being siphoned back into the water supply. A way to provide all closet tanks with this feature will be found, and will be probably made a code requirement in the future. Flushometer valves of satisfactory performance are on the market, but on account of the impossibility of operating them without accompaniment of some noise, they have not been universally adopted.

The Bidet. As a complement to the water closet, a bidet fixture is quite often installed in the modern bathroom. This fixture has been used in Europe for many years, but its popularity here has not been very great, owing perhaps to lack of education in its many advantages from therapeutic and personal cleanliness viewpoints. The bidet, however, should be installed with separate overhead supplies, feeding

Built-in Tiled Shower with Ventilated Plate Glass Door

Recessed Tub with Built-in Fixtures and Shower Lights

both hot and cold water down from a point at proper pressure above the fixture,—or with a downfeed and vacuum valves at the turn, so that siphonage of bowl contents back into the water supply is not possible. It is also well to install a non-scalding valve and equalizer on the douche connection, for obvious reasons. If a bidet is not provided, a hidden cabinet immediately at and above the closet is a desirable feature. Such a cabinet may be finished like the rest of the wall with a counterweighted tile door in brass strip frame, operated by a suitably located button and spring. A foot bath is a desirable additional fixture in a fully equipped bathroom, and by installing a sitz bath fixture of the hospital type with a douche connection, the functions of the sitz bath, the foot bath, and the bidet may be combined, as it may be used for all, with the continuous hot spray feature added. The douche supply must, however, be protected as in the bidet fixture.

Lavatories. For hand basins, there is an almost infinite variety to choose from, as the potters are continually turning out new designs. In the best work, a not overlarge lavatory is chosen, with a dressing table to match. When a lavatory is used also for general toilet purposes, even the larger sizes are likely to be unsightly in use on account of the multiplicity of combs, brushes, manicure aids, and cream jars left thereon. Like the tub, and for the same reason, the lavatory should have the water discharge into it from *above* and not *below* the rim. The faucets, brackets, legs or trimmings should match other plumbing hardware, and as already said, may be had in a wide variety of finish and design. The combination fixture having one outlet for water is a distinct advantage, as it provides water of any temperature for those who wish to wash in running water. As a companion to the lavatory, dental basins are being used quite extensively. They are made with flushing rims and gooseneck spouts, relieving lavatory basins of mouth washings when brushing teeth, or gargling the throat, such uses of the basins meant for ordinary purposes being repugnant to many. In addition to a small mirror over the lavatory and a winged triple mirror over the dressing table, a full-length mirror is not out of place in a fine bathroom. A metal framed couch covered with waterproof fabric is useful for rest or rubbing. The metal frame can be enameled to harmonize with the room finish, and the covering could harmonize with the shower curtains and hangings.

Bathroom windows should open to the outer air to get the benefit of the germicidal power of the sun's rays, but in addition every bathroom should have a local vent of some sort. Time was when the locally vented closet bowl was in vogue, but its disadvantages in installation and its liability to create

Photos. Mattie Edwards Hewitt

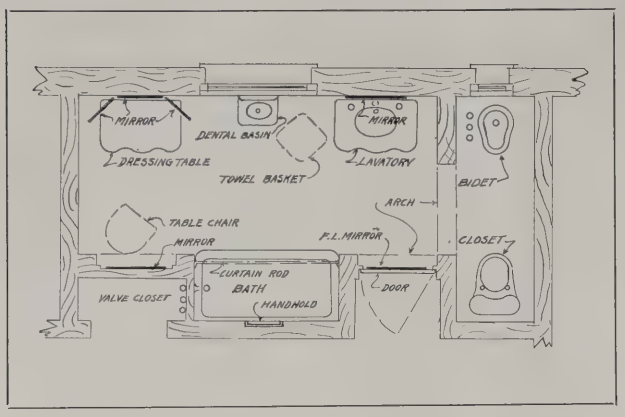
Tiled Bath Set Below the Level of the Floor

Convenient Tile Shelf Built Around the Tub

in a short time exactly the unsanitary conditions it sought to eliminate, prevent its use now in high class work. Humidity to the point of saturation occurs during hot or warm baths, and this as well as fixture odors must be balanced. This can generally be done by means of a small metal duct with a register near the fixture level and another at the ceiling, the duct leading to a ventilator at the roof. For the ordinary bathroom, 1 square inch of duct for each square foot in plan will be found ample, but it will not operate unless the lower panel of the door is louvered or unless there is some other satisfactory way of letting air into the room. A much smaller duct can be used if a very small electric ventilation set be installed, as has been done in much recent high grade work.

The bathroom of the master's chamber may be as fully equipped as that for the mistress, except that the dressing table will probably be omitted, the winged mirror put over the lavatory for shaving, and the full length mirror be left out. The tiling and color scheme will probably be more severe, and the plumbing hardware more substantial and less ornate in appearance. The master may, and probably will, prefer that the shower be a separate fixture, in which case the best practice is to place it in a tiled enclosure with a metal framed, plate glass door. These frames, of special anti-splash construction, can be had from all manufacturers of high grade plumbing, and can be built into the tile enclosure on the work. The enclosure should be constructed with a curbing at least 6 inches high in front, and the drain should be of the corner pattern, draining the bath from the floor and wall curbing so that waste will not be stopped by the bather's feet or by a wet towel carelessly left lying over it. These drains can be obtained with double drainage features and flanges to lock to the lead pan or other waterproofing member under the shower floor. If sons' and daughters' bathrooms are to be provided they will, in general, have a similarity to those of the master and mistress of the house, with changes dictated by users' ages, tastes, and similar considerations.

In the main, regarding the guest rooms, consideration being given to the fact they will frequently be occupied by couples, the baths should partake more or less of the character of the master baths, first described, except that space may be more or less constricted. There will be no room for couches, and if a bidet is included, the foot or sitz bath may be omitted. In these rooms the tub and shower are best combined. The lesser or "expansion" guest rooms, to take care of week-end parties and special gatherings, may be provided with the more ordinary three-fixture equipment with combination tub and shower such as we find in our best hotels; usually one bathroom to two such guest rooms will be found



Plan of a Well Arranged Modern Bathroom

sufficient. The servants' bathrooms should be ample to give privacy, and in general probably they would be equipped in the same way with the same class of fixtures as the lesser guest rooms, although tubs might be omitted and showers used in men's quarters.

Pools. Few country houses of any extent today are built without their swimming pools for recreation and entertainment. The principal pool, and quite often the only pool, is usually in the grounds, near enough to the house for convenience, yet at a sufficient distance to be screened somewhat in the landscaping and to muffle the splash and occasional shouts of noisy bathers. Where an outdoor pool is provided, it is an advantage to have a smaller indoor pool as well, if room for it can be conveniently had, and if the budget will permit. An indoor pool can be heated so as to be available for general use during cooler weather, and it may be on occasion of most distinct therapeutic value in connection with an electric cabinet in the treatment and relief of overtired muscles or strain after sports.

The construction followed for both pools is similar, and it is generally a concrete basin lined with a finishing material to add smoothness, light, and sometimes decoration. In times past, marble slabwork was used extensively for pool lining, but the absorption of the material, and the cracking at the joints, introduced by ever so slight a settlement or by expansion and contraction, have caused it to be discarded generally for construction of either specially formed brick or of small encaustic tile with mosaic border. The tiles used are flat hexagonal or ¾-inch cubes laid in two-coat work over a waterproofing coat on the inside of the concrete walls and bottom, the setting plaster being rich cement and sand mixture with just enough lime putty added to work it. Ordinary glazed tile cannot be satisfactorily used in swimming pool work, on account of crazing, nor can the standard glazed brick be worked well. Brick for pool linings are specially made for the purpose and come in shapes for locked corners and edges and with formed, graded, scum gutters with necessary outlet sections. Generally, the pool lining should be white, so that one may be able to see the water condition at all times. Any warmth in color or decorations should be in the borders above the water line and the setting, or in the room if it is an inside pool. The concrete basin for the pool lining must be designed for the weight of water, and the walls and bottom must be reinforced to take the load. Its structural features must be as carefully figured as those of any other part of the building construction work, or it may crack and cause leaks or ruin the appearance of the lining. Once the lining shows definite evidences of a structural crack, it is very difficult, if not impossible, to repair the lining so that it will present a smooth and satisfactory appearance.

Piping. It is of course, most important that the piping equipment and the general plumbing design be in accordance with standard sanitary practice. Practically all cities and many states have plumbing codes which prescribe definitely the general manner in which the work must be piped, but too much care cannot be exercised in the planning of details and in supervising the installation of the work. It is much better to have all pipes relieved and graded, all joints straight and well made, and all hidden materials of permanent lasting quality, than to tear out expensive tiling and decorated walls from time to time to relieve stoppages, repair breaks, and replace rusted pipes. With sewers from a point 20 feet from the building and all stacks and main vents of extra heavy cast-iron soil pipe, and all small wastes of brass pipe with either cast-iron or cast-brass recessed drainage fittings and all water supply pipe, both hot and cold, of red brass (Class A) with extra heavy red brass, Navy Standard pattern fittings, one will have, with proper installation, a piping equipment to last a century. However, less costly piping may be provided that will give excellent results.

Water Supply. It is presumed that the water supply question has been carefully gone into and that it is ample, clear, and free from organisms. If not obtained from some city or community system under pressure, the question of pumping and storage becomes of moment. If the supply has to be raised from wells, it is good policy to use two pumps, one to pump to a cistern at well head level, and another to put it under pressure. This gives opportunity to use an air lift from the well itself with the advantage of thorough aëration of the water, the surplus air escaping from the still water in the cistern. From the cistern the water can be placed under pressure in suitable cylindrical underground pressure tanks with heads exposed in the cellar or in the pump house. The tank heads should have gauge glasses and gauges, and the tanks should be absolutely air-tight with no openings into the tanks above the normal water line other than the top gauge glass connection; all inlets, outlets, and cross-connections between tanks should be at the bottom. These pumps should be automatically-operated rotary or centrifugal machines which minimize the noise as much as possible, and they should have either adjustable "snifter valves" on them to provide a supply of air to the tanks or a separate automatic air pump should

be provided. The air lift pumps are practically noiseless also. In some respects, having single pumping and elevated tanks is good practice, but as such tanks have to be placed high above the top fixture supplied to give good service, the tank structure disfigures the landscape and makes it objectionable.

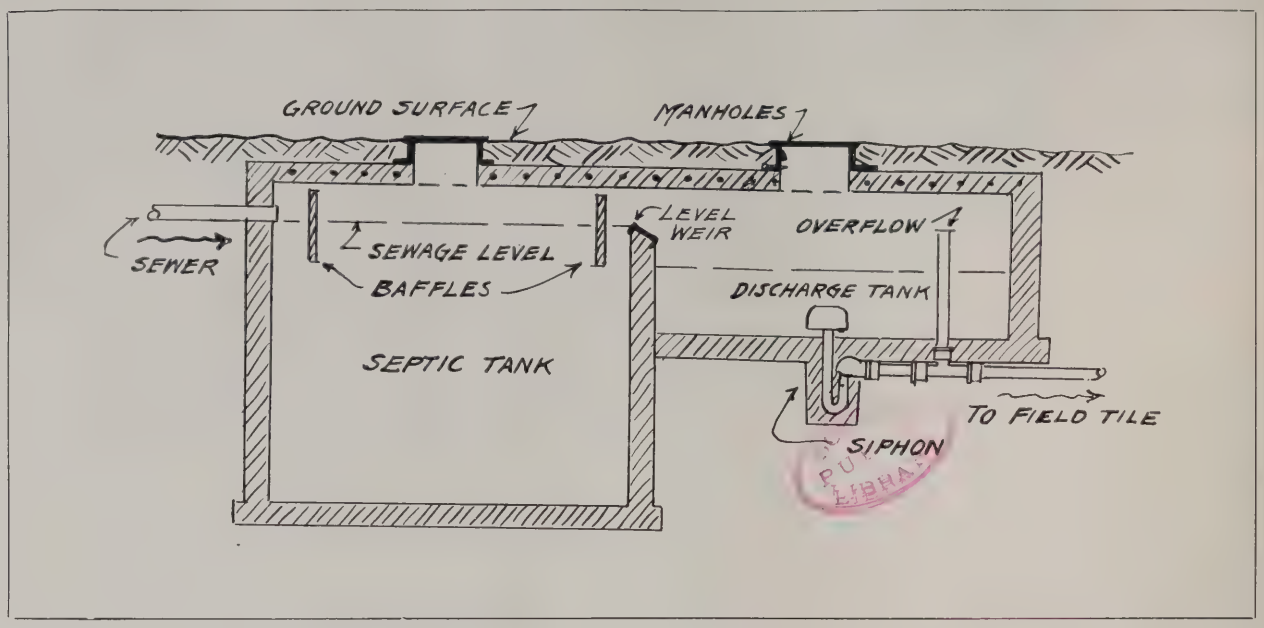
There is a further advantage in use of the double pump system on account of its elasticity. A well of fine water may have a capacity without seriously lowering its pumpage level great enough to cover the 24-hour needs many times over, and yet still be unable to stand peak load delivery requirements without lowering the water table to a point where sanding and foot valve fouling will occur. The well pump may be comparatively small for continuous duty and the pressure pump large enough to care for maximum requirements, the cistern acting as the intermediate balance. For good, noiseless service, the velocity in the pipes must be kept low, say not more than 10 to 12 feet per second, and this means large mains and branches. In general, no supply over 5 feet long should be less than of ¾-inch and not more than two fixtures on that, four on a 1-inch, and similar large capacities. Shock absorbers with vibration diaphragms should be placed on all dead ends; all soil, waste and water supply pipe should be wrapped so that it will not touch structural parts, and every precaution should be taken to make the system quiet, by preventing noise as far as possible, and by preventing transmission of what little is made.

If the country house is by the sea, it is often desirable to have a complete hot and cold sea-water supply system to the bath tubs. If the showers are also to be provided from a sea-water source, it is better to have entirely separate shower fixtures, placed on opposite walls of the same enclosures, so that there is no liability of cross-connection of the two kinds of water. This, of course, means separate pumps, tanks and heating units, and it is good practice to paint the exposed pipes in basements in different colors to distinguish them from the potable water lines and fittings.

Sewage Disposal. If there is no municipal or other proper sewer system to which connection can be made, then the problem of sewage disposal presents itself, as it is rare that raw sewage can safely be discharged into a river or estuary. It is sometimes run directly into the sea, if there is no beach, but it is never safe to discharge directly into the soil for ground absorption. The usual successful disposal system is based on the "septic tank" idea, which means a combined settling tank and bacterial reduction chamber. The common form is a rectangular settling tank of sufficient depth and so shaped in plan as to facilitate slow movement of the sewage through it. This tank should be designed to hold the anticipated average daily flow, figured at about 100 gallons per person or a little over. One drawback to these simple rectangular tanks rests in their failure to reduce the sewage properly if they are either underworked or overworked for any appreciable length of time, and this is a condition likely to prevail if there is a very elastic guest list. If the daily quantity estimated for often and repeatedly falls to a discharge which will occupy much over 40 hours in passing through the tank, the sewage will become stale, the liquid will not give up the matter in suspension and solution, and the outfall lines or the secondary system, whatever it will be, will clog, and the system may give off odors. The same thing will occur when the passage through the tank is hurried, as the sewage has not sufficient time to properly liquify. This condition can be to a great extent offset by substituting for the rectangular tank, a special shape on a modified "Imhof" design, which, while much more expensive, is smaller, and capable of giving very elastic results. Normally, it can be figured for a minimum use by a skeleton household, and it will digest sewage for twice as many for a week or more at a time, and four or five times its normal for a week-end.

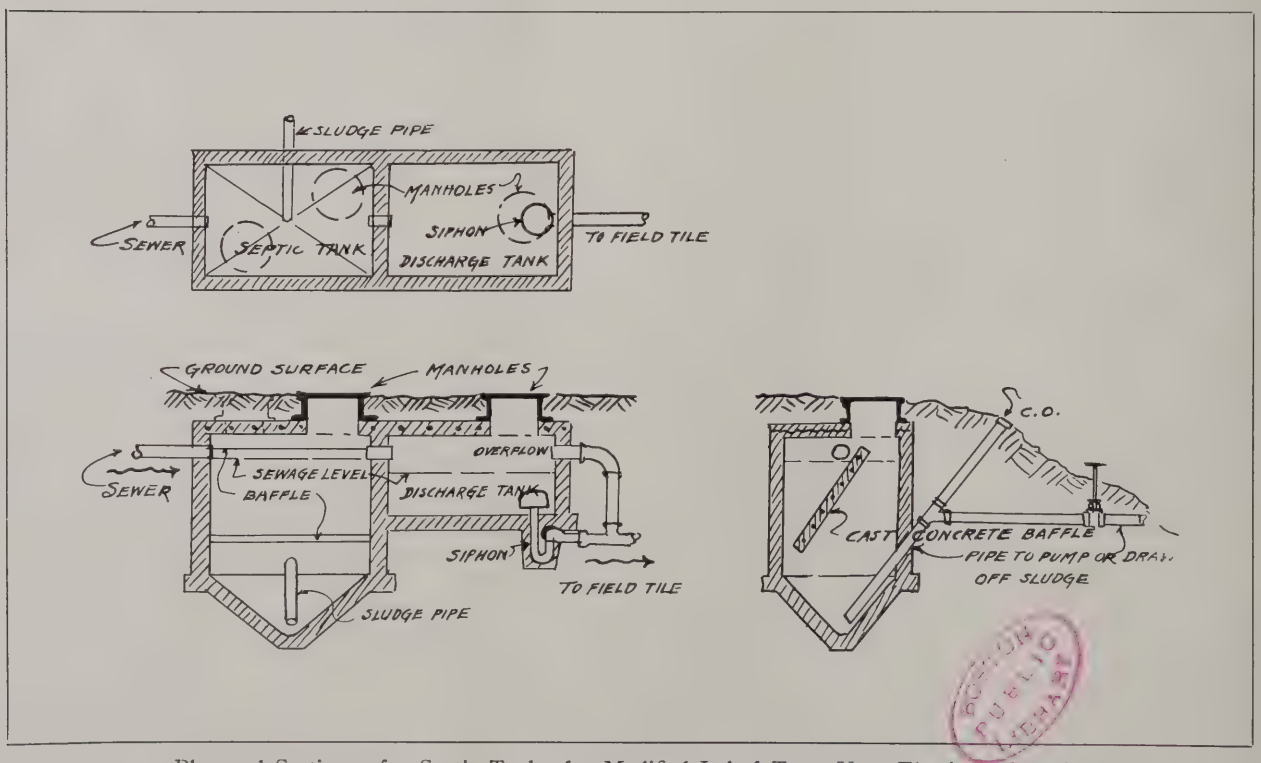
Architectural Treatment Possible in Larger Bathrooms

The treatment of the liquified sewage as it comes from the first tank is dictated by the ultimate means of disposal. If the effluent is to be discharged into a large river, no further treatment will be necessary if the dilution at the point of discharge is a million or more to one, but if less than that, secondary treatment is necessary, and sometimes even a third process. If the ground nearby is absorptive, a siphon chamber can be attached to the primary tank and a drain tile field can be constructed in trenches with the drain tile surrounded by broken stone, coke or large gravel, the tile being laid with butted joints covered with copper-mesh screen or special tile covers. The tile should be laid about a foot deep to the top of the pipes, and there should be two or three separate fields constructed, each sufficient to hold the discharge of the siphon chamber. Three- or 4-inch porous tile are best, and the fields can be made to alternate by a manually-operated gate chamber, changing every week. If the ground contains much clay or is hard, more tile may be added. The siphon chamber should be arranged to discharge not oftener than once in four hours, even under the



Longitudinal Section of a Simple Rectangular Single Chamber Septic Tank

heaviest usage. Hard ground can be improved by underdraining the first field drain tile by alternate lines of smaller drain tile between and below the others and leading these off into a secondary field, or the underdrain can be turned into a stream with a dilution of 1000 or more to one. The drain tile system of taking care of the discharge from the septic tank is very generally used, although there are other secondary processes which may be more applicable to a given condition, most of which require some periodical care in the operation. Sand beds with underdrains are sometimes used, as also are time lock contact filters, sprinkling filters, chemical "fish-ladders," and electrical treatment works. The amount of sewage to be cared for, the presence of chemicals in the sewage, the availabiilty of watercourses, the character of the ground, the degree of purification sought, and many other considerations enter into the problem, which requires the closest study by the architect and his engineering assistants.



Plan and Sections of a Septic Tank of a Modified Imhof Type, Very Elastic in Capacity

ELECTRICAL EQUIPMENT FOR THE COUNTRY HOUSE

BY
NELSON C. ROSS
ELECTRICAL ENGINEER

THE electrical wiring and equipment for the country house will be influenced largely by the type and construction of the building, the character of the service available, and the extent of the domestic and electrical equipment desired.

In planning the layout, the type of construction and the available service must first be determined, as they affect the distributing system as well as the materials to be used. In frame buildings, concealed knob and tube wiring is permissible in dry places. Service wires, however, must be in conduits, and all basements must be wired with conduits or with "BX" armored conductors. While knob and tube wiring, properly installed where kept dry and where the wires are not subjected to mechanical injury, is fairly safe, it has little to recommend it other than cheapness in first cost. The use of "BX" flexible armored conductors will insure a more flexible wiring system throughout wooden buildings, since the conductors are protected from mechanical injury. The armor permits of a satisfactory bond and ground; splices occur only in steel outlet boxes, and the conductors are continuous from outlet to outlet. Armored conductors on new work are clipped to the beams and studding. Where used on old work, the armored conductor permits of concealed wiring with the conductors "fished" in the construction and with the minimum cutting of walls and floors, while metal raceways or mouldings are used in existing buildings for extensions of circuits or for use where it becomes impossible to conceal wiring. Concealed wiring, properly installed, is always to be preferred to any type of exposed work. The latter should not be considered except for garages and other service buildings. Where granolithic or tile floors occur in certain sections of a wooden building in which "BX" is used, circuits must be in rigid conduits in these floors.

The use of armored conductors, while safer and more expensive than knob and tube wiring, is less expensive than wiring in rigid conduits. Its disadvantages are that it is difficult to replace, in case of trouble on the circuits after the building is completed, without considerable cutting, and the armor is not proof against injury from nails. Trouble experienced on electrical circuit wiring is, in general, due to lack of care in the installation of the wires, and to improper splicing and to the crowding of the wires in the outlets. It is therefore advisable with the use of armored conductors on new work to provide the standard 4-inch outlet box (as used for rigid conduits) at all outlets, equipping these with the proper plaster rings and switch covers. Where armored wires enter the outlets, each should be fitted with approved galvanized box connecters of the clamp type, and these should be clamped to the armor and secured to the outlet boxes with lock nuts. Similar outlet boxes should also be used on knob and tube construction (where safe work is desired), each wire of the circuit entering the outlet box encased in a flexible loom tube extending from the fixture connection to the first knob on the circuit. Where old work does not permit the use of 4-inch standard outlet boxes, a type should be selected that will permit the armor to be securely clamped to the box, forming a satisfactory bond and preventing the loosening of the armor from the box or plate. With first class construction, the use of rigid conduits is obligatory, and these conduits are cast in the slab, built in walls, run behind furring and in concrete beams, or in some cases, run exposed. Expense warranting, rigid conduit should be used for all classes of construction, as the conduit forms a steel pipe raceway, giving perfect protection to the circuit wires and permitting the removal and replacement of defective wires at will.

Lighting Requirements. A room or space must be provided in the basement, adjacent to the location of the entering service cables, for the mounting of the service switchboards and meters. All circuits throughout the house, service buildings and estate will be mastered from the service switchboard. From the service switchboard feeders will be run to the panel boards, and branch circuits will distribute from the panel boards to the lighting and domestic outlets. The panel boards may be conveniently located in the basements, in service corridors, or in closets on the different floors. One or more panel boards may be required, depending on the size and type of the building and the volume of the load. It is well, however, to so locate the panel boards that the length of branch circuits will not exceed 60 feet.

In planning the circuit wiring, lighting outlets must be spaced to meet the required lighting conditions and also with reference to exposed beams, wall paneling, and fixed furniture. In general, not more than eight lighting outlets or more than four receptacle outlets should be connected to a branch circuit, and where receptacle outlets are to be used with portable equipment of high wattage (such as radiant heaters in bathrooms, table grills, etc.), such receptacles should be fed from a single circuit of two No. 12 wires from the panel board. Separate circuits should be employed for lighting and for receptacle outlets so that the opening of a fuse due to the overloading of a receptacle circuit will not interfere with the lighting service.

Local switches may be of the flush push-button, toggle or rotary type, as desired, and may be had with plates of any color or finish. The toggle type is usually preferred in country houses. A sufficient

number of switches should be provided for the adequate control of the lighting. Switches may be set where they are convenient to the doors entering the room, and where there are two or more entrances to larger rooms, three-way switch control should be considered. It is at times desirable to use double circuits for chandeliers, permitting the use of a part or of the whole of the lighting at will. Three-way switch control of corridor and stair lighting is very desirable, permitting the control of corridor lighting from two or more points and of the stair lighting from switches on different landings.

Receptacle or convenience outlets may be placed in baseboards or set from 12 to 18 inches above the floor. Convenience outlets should be used generally throughout the building, allowing for one receptacle outlet to each 20 feet of wall space. Where possible, the location of furniture should be determined before bracket outlets and receptacles are permanently placed, particularly in reference to bedrooms where fixtures are to be used at beds, mirrors, dressing tables, etc. Provision may be made for electric clocks, with receptacles at mantels or at other desired locations. Where fans are to be used, the outlets may be set 7 feet, 6 inches above the floor, using a combined receptacle and hanger. Fans may be under switch control, or may be operated at the outlets. Where paintings are to be lighted, the receptacles may be set 8 feet, 6 inches above the floor, in readiness for the reflectors. Such outlets should be under switch control.

Provisions for radio will include a master receptacle outlet at the location of the set, with similar outlets in rooms where loud speakers or headphones are desired. Receptacle boxes and conduits with rubber-covered wire will be required as in a lighting service, using standard radio jack receptacles at outlets.

Lighting Fixtures. In general, the lighting fixtures throughout the service quarters, basements, laundry, kitchens, and out-buildings may be of the conventional type, employing an enclosed radiant with ceiling collar, chain or rigid hanger. Lighting fixtures throughout the house proper, including ceiling chandeliers, brackets, floor lamps and portables, will be selected by the owner in consultation with the architect, and will correspond in design with the surrounding furniture of the rooms.

Suggested Outlet Locations

Entrance. Ceiling and bracket outlets; provision for outside fixtures; convenience receptacles; local switches; switches controlling outside lighting; public and interior telephone.

Corridors and Stairs. Ceiling and bracket outlets, three-way switch control; convenience receptacles; fire alarm station and gong.

Closets. Ceiling outlets under door switch control; panel boards as required.

Service Corridor. Ceiling outlets, three-way switch control; annunciator; burglar alarm annunciator; interior telephone; panel boards; burglar alarm switch.

Living Room, Dining Room, Library, Lounge, Etc. Chandeliers with double-switch control; brackets; floor receptacles at tables; annunciator receptacles at table; convenience receptacles for floor lamps; heater receptacles; annunciator push-buttons; clock and radio outlets; electric fireplace logs; public and interior telephone.

Chambers. Brackets and receptacles at beds, dressing tables, and mirrors, switch control; annunciator push-buttons; radio outlets; public and interior telephone if desired; brackets each side of mirror in bathroom; annunciator push-button in bathroom, heater and convenience receptacle in bathroom.

Billiard Room. Ceiling outlets over tables, switch control; convenience receptacles; push-button to annunciator, radio and clock outlets; interior telephones; fireplace logs.

Kitchen. Outlets for electric range, broiler, and oven; ceiling outlets; outlets over sinks; receptacles for refrigerator; convenience outlets; outlets for water heater; outlets under range hood; clock outlet; interior telephone; switch control, etc.

Laundry. Outlets for electric washer, water heater, extractor, flat work ironer, and electric irons; convenience outlets; ceiling outlets for general illumination; drop cords at flatiron stands; switch control and interior telephone.

Basement. Ceiling outlets in storage rooms, and for general illumination, under local switch control. Convenience outlets in boiler room; interior telephone; storage battery for burglar alarm and fire alarm and interior telephones. Distributing power panel boards, etc.

Motors. Small domestic and portable motor-driven equipment has been developed and standardized with 110-volt, single-phase motors for operation on lighting circuits. These motors seldom exceed ¼ horse power in size, and are designed to plug into a standard receptacle. Motors exceeding 1 horse power in size should, if possible, be operated from the power circuits, and where single-phase only is available for power, such motors should operate on a separate feeder from the service switchboards. Where there are a number of motors, it is desirable to provide a separate power panel, centrally located in the basement, and fed from the service switchboard with branch fused power circuits leading from the panel to the different motors. For the elevator, the circuit should terminate in the elevator machine room in a fused safety switch, and be left in readiness for connection to the controller. Circuits for the operation of portable farm motors may terminate in fused safety switches and high wattage receptacles, from which portable cables may extend to machines. The circuits, switches, and receptacles should provide for the value, 20 horse power.

Where use of oil burners is contemplated, a separate circuit must be run to each burner, terminating in a safety switch. Circuits for shop motors in garages and farm buildings should terminate in safety switches, with the circuits extended, and connected to

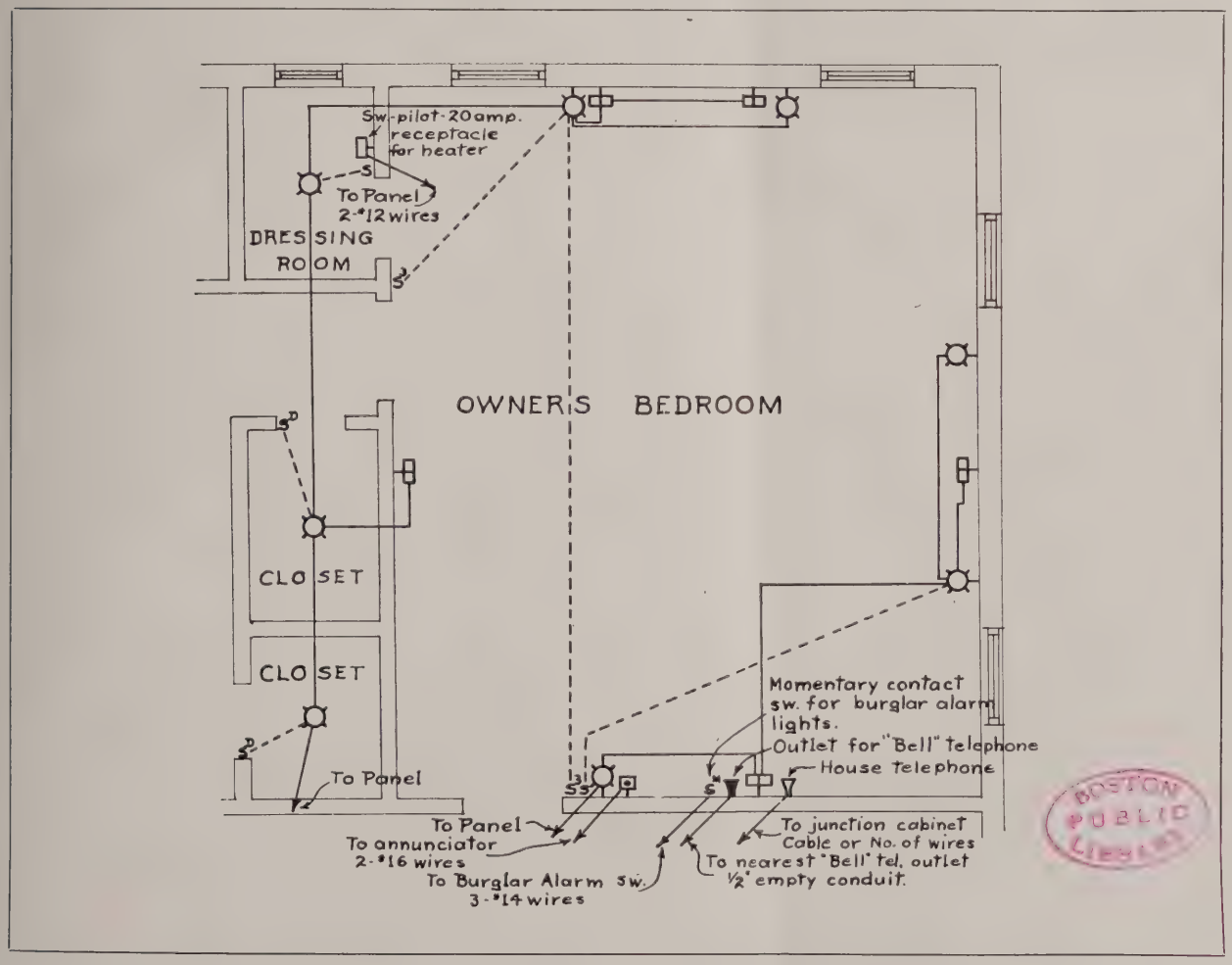
the motors and equipment. These shop motors seldom exceed 1 horse power at each motor outlet. Plumbing equipment may be housed at the water supply, and may be automatically controlled, this fed from either pole lines or with underground cables from the nearest point of service. Such equipment may be in duplicate to guard against breakdown, the size of the cables depending on the distance run and the capacity of the equipment.

Refrigeration. "Portable" refrigerators may be fed from a single circuit and receptacle, the receptacle usually set 7 feet above the floor. Where a "built-in" refrigerator plant is used with "walk in" cold boxes, provision should be made for from 3 to 5 horse power in the refrigerator machine room for the operation for the compressor and pumps. Waterproof lighting fixtures must be provided in the cold boxes, with switches and pilot lamps at the doors.

Water Heating. Self-contained electric water heaters are available of either the storage tank type, with the heating element immersed in the tank, or of the circulating type where the element is separate from the tank, as with gas. Standard tank sizes range from 10 gallons to 52 gallons, with the current demand of from 1000 watts to 5000 watts respectively. Either type may be fitted with automatic thermostatic control. Large installations may require special storage tanks and should be designed to meet conditions. The feeding circuit should not be less than three No. 8 wires.

General Heating. Electric toilet equipment, including curlers, hair dryers, massage equipment, lamps, etc., will operate from the convenience receptacles in bedrooms and bathrooms. Portable heaters, of not exceeding 1000 watts, may connect to the heater receptacles in the bathrooms or to any receptacles controlled from a separate circuit from the panel board. Where "built-in" electric radiators are desired, in bathrooms or elsewhere, provision should be made for 3000 watts at the outlet, and this should be fed with three No. 10 wires. If electric fireplace radiators are desired, provision should be made for not less than 4000 watts at each fireplace, with 30-ampere receptacles and three No. 8 wires. Single circuits should connect to the floor outlet at the dining table, and also at buffet, etc., to provide for electric percolators, grills, toasters, or other table equipment. Where small grills are to be used in serving rooms or in pantry, provision for 3000 watts should be made at outlets with three No. 10 wires.

Cooking. Electrical cooking equipment may include a range and oven in the kitchen, as well as electric broiler and such minor cooking equipment as may be operated from the kitchen receptacles. Ranges



Typical Layout for a Master Bedroom

are available in either the household type, with the connected current demand of from 8,500 to 13,800 watts, or of the heavy duty type with the connected current demand of from 22,000 to 30,000 watts. Both types are fitted with the back shelf and oven and may be operated either on single-phase or on three-phase wiring and from either the lighting circuit or power circuit. Cutouts and controlling switches, etc., are provided as a part of the ranges in readiness for the connection of feeder cables. Conduits and cables may extend from the basement to terminate in the range connections. Feeder cables should not be of smaller than No. 2 wires for the smaller and three No. 00 wires for the larger range. Where separate broilers are desired, provision of from 4000 to 8000 watts at the outlet should be made with not less than three No. 8 wires.

Laundry. The electrical laundry equipment may include one or more household washers, a motor-driven extractor, an electric ironer, and the usual equipment of electric flatirons with ironing stands, including also, if desired, an electric water heater, and storage tank. Feeder wires to the water heater should be not less than three No. 8 wires. All of the laundry equipment, with the exception of the water heater, may be operated from receptacles conveniently located, the cords from the machines plugging into the receptacles outlets. The use of a heater combination, including receptacles, switch and pilot lamp, is a convenience, as the lamp indicates when the heaters are in circuit. Each receptacle should be fed with two No. 12 wires.

Communication. Low-tension equipment will include an annunciator in the service quarters, with push-buttons at the entrance doors; flush floor push-button receptacles under tables in dining room; push-button stations in bathrooms, bedrooms, guest rooms, etc., and elsewhere, as desired. Two or more annunciators may be used if required by conditions and may be connected in multiple so that any signal will register on all annunciators. Switching may be so arranged that any annunciator may be cut out of circuit. Thus, with an annunciator in the kitchen or service room, with a like annunciator in the corridor of the servants' quarters, switching may be arranged so that the signal will register in the service room or kitchen during the day, and in the servants' corridor during the night. Where desired, the system may be made "return call," with a button pad as a part of each annunciator and with the combined buzzer and button in each room, etc. Whoever receives a call on an annunciator may, by pressing the corresponding number of the pad, notify the sender that the call has been received. The combined buzzer and push-button is set flush with the walls in the rooms, etc., and resembles an ordinary flush push-button plate. Annunciator wiring should be of rubber-covered No. 16 wire, in conduits; current for the operation of the system may be taken either from local batteries or from low-tension transformers. Annunciators may be of the flush type and are made up in wood in any finish, in metal, or in cast bronze as desired. Push-buttons, where exposed to the weather, as at entrance doors, etc., should be of bronze and of the waterproof type.

Inter-communicating House Telephones. The house telephone equipment may be of the local inter-communicating type, with instruments separate from the public service lines, or it may be a combined public and inter-communicating system. The local inter-communicating system has no connection with the public service line, but is used wholly for interior work with extensions to dependent buildings. House instruments may be of the flush wall type or of the desk type, and may be finished as desired. Instruments in general are located in certain bedrooms, kitchen, serving room, pantry, corridors, laundry, garage, service quarters, and dependent buildings. Wires and cables are preferably installed in conduits, and where cables pass underground to dependent buildings, etc., these wires must be sheathed with lead and installed in conduits or protected with steel tape armor of the "Parkway" type. Where the local system is used, provision should be made for use of one or more independent public telephone instruments, as may be desired. Where, however, it is desired to talk over the public service lines from any of the telephone instruments, the combined system may be used as provided by the telephone company. When each instrument is fitted with a series of push-buttons corresponding to the local stations, and with one or more trunk stations connecting with the central office, local calls may be made between the house stations without calling the central office, and the central office may be called from any station by depressing the "trunk" button. With this system conduit only is provided, as the wires and cables, instruments, etc., are furnished and installed by the company under a rental arrangement. The telephone service lines will be provided by the company and terminated on the public right of way convenient to the property. The trunk lines may be run to the house either on poles or underground; a conduit should be provided between the house and the service pole. This conduit may be of fiber or of galvanized iron, and should be laid with long bends and not less than 15 inches below grade. Manhole pits or splicing boxes should be provided not more than 300 feet apart.

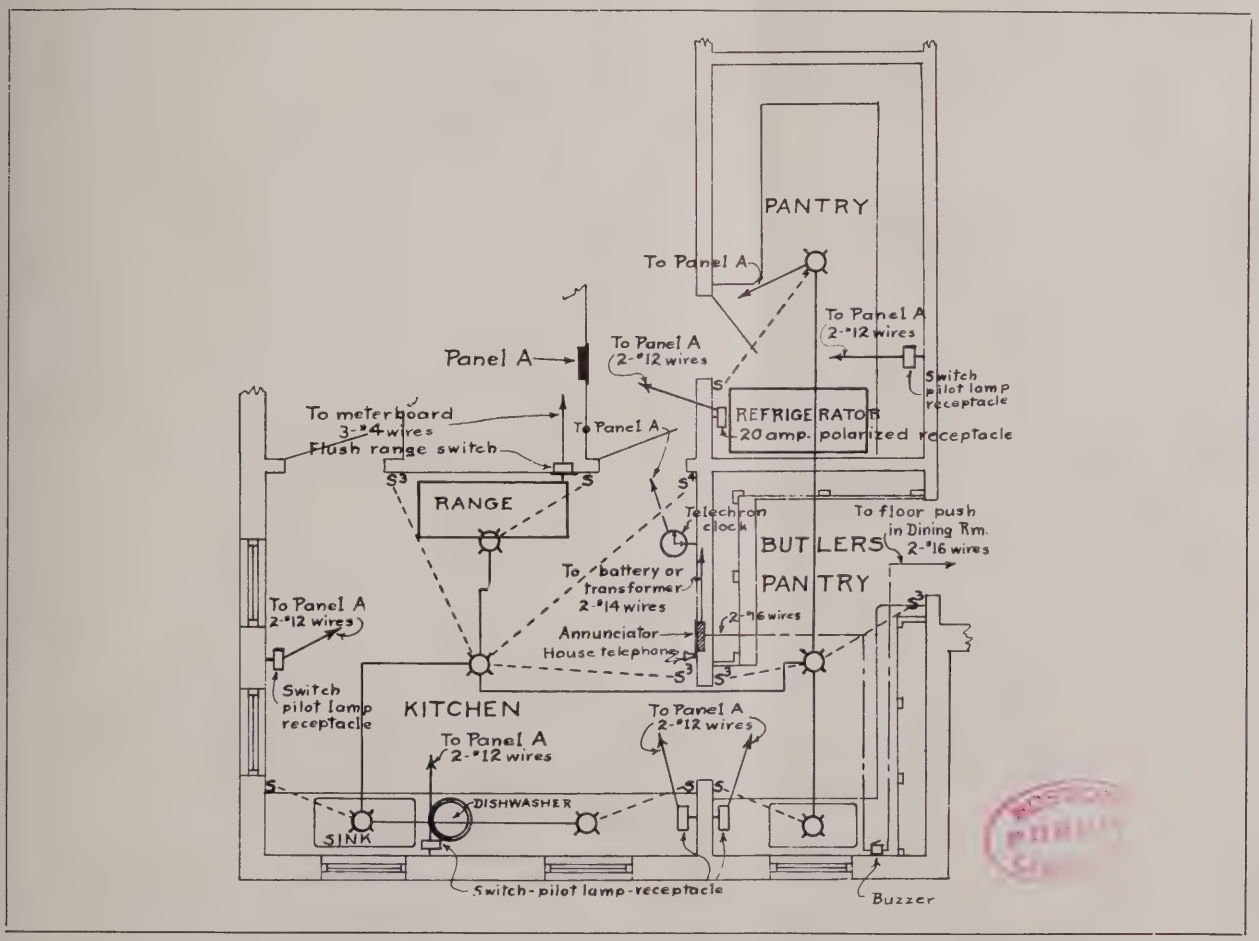
Fire Alarm. This detail of the equipment of the country house may be of the open-circuit type, wherein the gongs are rung from a battery from the lighting service, or it may be of the closed-circuit type, wherein the gongs are tripped electrically and are rung by means of a spring-wound motor in each gong. Of the two systems, the closed-circuit is to be preferred in many cases. The system is operated by the breaking of a glass with a small suspended hammer in any one of the stations, and the system is supervised so that in the event of accidental breakage of any wire, a "trouble bell" will ring until the circuit is restored. The automatic system, in which the heat of the fire itself sets off the alarm, is much

used also. Gongs should be placed on each floor, and not more than 75 feet apart. Stations, as a rule, are placed one under each gong at approximately 5 feet above the floor. Gongs are also placed in dependent buildings to summon help in the event of fire. The code wheel of each station is so cut as to deliver a certain signal, and the location of the station from which the alarm originates is at once determined by the code signal sounded on the gong. A fire alarm system should operate by storage battery rather than from the lighting service, as the operation of the system is thus assured even though the lighting lines are out of order. Fire alarm wires should be run in conduit, and where installed underground between buildings they should be sheathed with lead and installed in conduits, or lead-sheathed wires should be protected with armor of the "Parkway" type.

Burglar Alarm Systems. The "house" burglar alarm, in general, consists of one or more gongs which are automatically rung upon the closing of a circuit ("by the opening of any door or window protected by the system"). Gongs may be installed in dependent buildings, from which help may be summoned, or in the house, as desired. Concealed switches are located in the doors and windows to be protected, and the system is so wired that the opening of any door or window so protected will close the circuit and operate the gongs. The system may be rendered inoperative by the opening of a master switch at some convenient point. An annunciator may be used in connection with the system, which will indicate the location of the door or window from which the signal is given. The wires of the system should be rubber-covered No. 16 wire in conduits, and where they are underground they should be sheathed with lead and either run in conduits or protected with tape armor. The system should be operated by storage batteries rather than from the lighting circuits, as this insures the operation of the system in the event of trouble on the lines. A further protection is afforded by the system, in that during storms, the closing of a master switch will indicate on the annunciator the location of any door or window which may be open.

Dependencies

Stables. The wiring of stables should be in rigid conduit, and as a rule "exposed," using receptacle fittings of the conduit type with lamp bulb and guard. Lighting should be under local switch control and mastered from a service switch at a convenient point. Provision should be made for convenience outlets permitting the use of portable equipment. Provision should be made for outside lighting with



Typical Layout for a Country House Kitchen

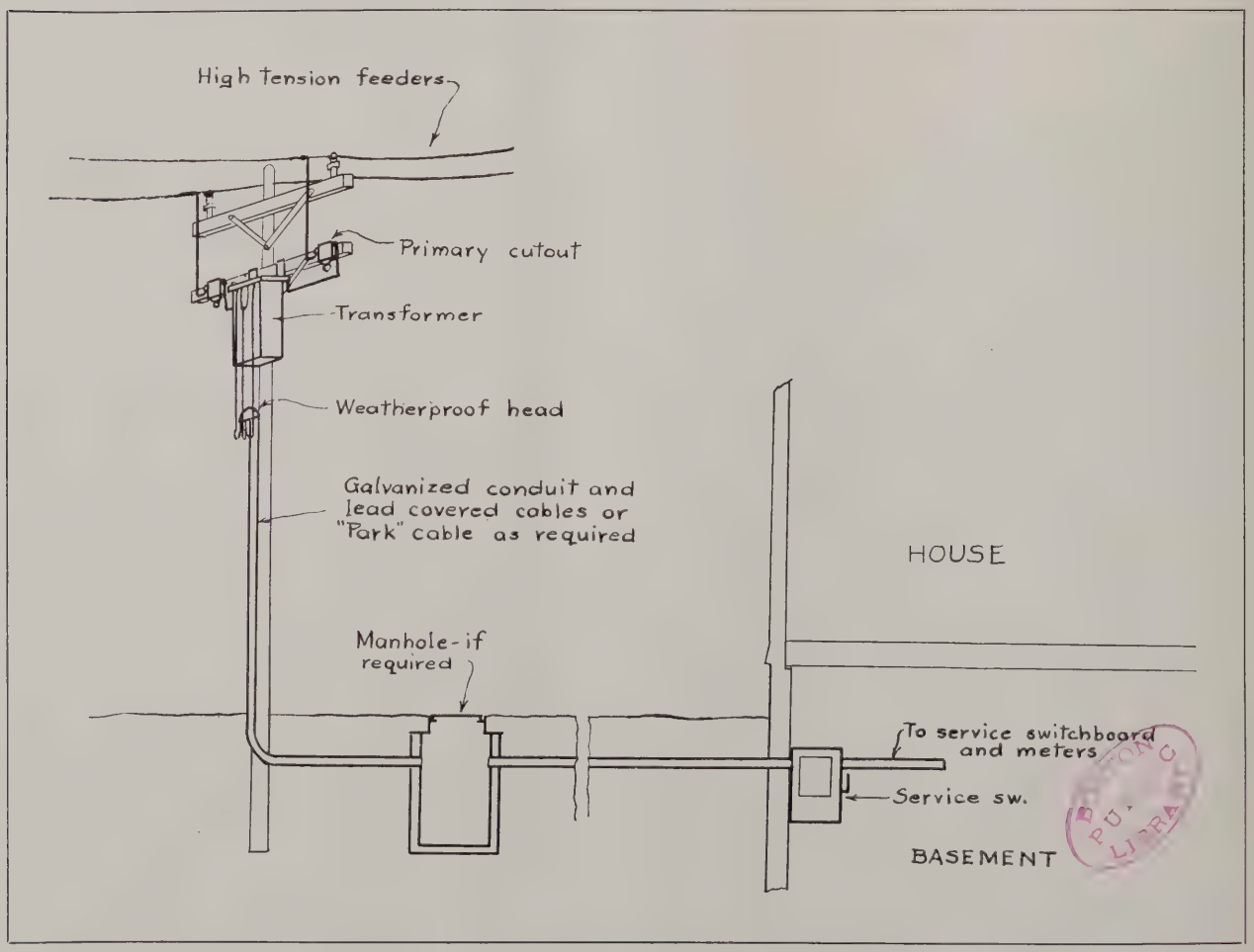
brackets at the entering door. The wiring of the stable should include provision for a fire alarm as well as for a local telephone. Connections with the main service should be by underground cables.

Garage. The wiring of the garage should be in rigid conduit, and should be equipped with lamp receptacles and guards, including outside lighting by means of brackets at the doors. The wiring will include ceiling outlets at the front and rear of each car, convenience receptacles for use of portable lamps, and power outlets for lathe, grinder, air pump, storage battery charger, etc.

Farm Group. Such a group will, as a rule, require a separate service, with its transformer vault, as these buildings require a heavy motor load in addition to lighting requirements. The wiring of the dwelling house of the farm group will be concealed, and will provide for general lighting and equipment with convenience receptacles and with high wattage receptacles for possible use in electric cooking. Provision also should be made for public and local telephones, as well as for the gong of the fire system.

The barns and farm buildings proper are preferably wired with exposed galvanized conduit, using ceiling lamp receptacles with guards. Lighting outlets must be so spaced that there will be adequate light for all purposes without the use of lanterns. Three-way switch control should be considered for the lighting of lofts, cattle barns, storehouses, and other large areas. Provision should be made for the lighting of the laying houses of the poultry section as well as for electric incubation and brooding. Convenience receptacles should be provided for the use of portable equipment and milking machines. Power should be considered for the use of portable motors, for the sawing of wood, and the cutting of silage as well as power for the repair shop and for the possible pumping of water. The buildings should be equipped for a fire alarm, and the larger structures should have both public and private telephones.

Lighting of Grounds, Entrances, Etc. The lighting of grounds may be with any one of the many types of posts and standards. These may be spaced from 100 to 300 feet apart (along the drives) depending on the location of the shrubbery. The standards may be connected with underground cables of the "Parkway" type. The standards at the entrance gates and on the main drive may, if desired, be separately controlled and independent of the general ground lighting. The circuits may be fed from the house service, and be controlled manually from push-button controlled switches, or from "time switches" which will automatically switch the lighting on and off at certain hours. Ground lighting immediate to



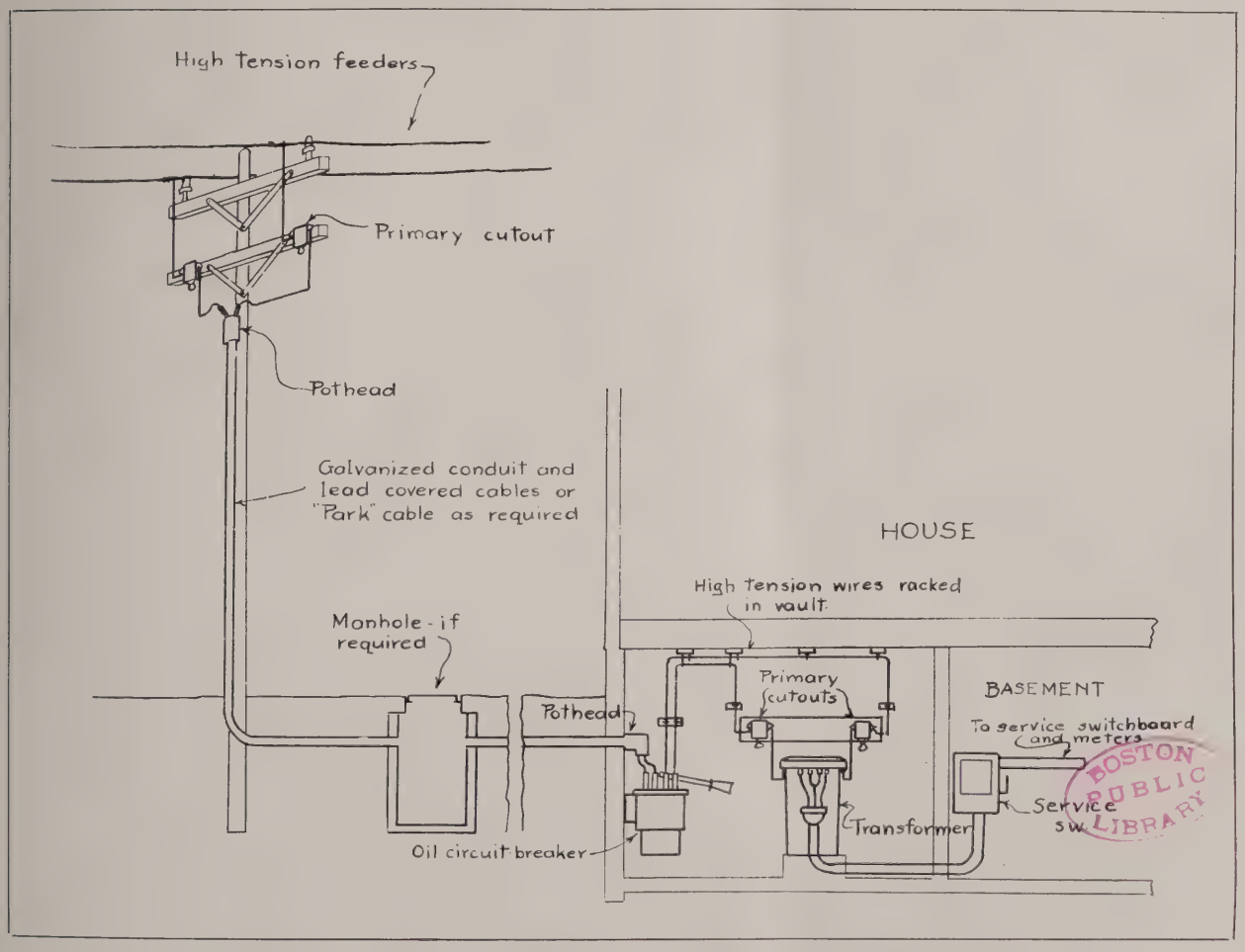
Underground Service with Transformer on a Pole

the farm group may feed from the farm service under either hand or automatic switch control. Ground lighting immediate to the farm may be developed on poles, with fixtures secured to buildings.

Underground Cables and Distribution. The least expensive form of construction for the cable system is with poles and overhead wiring. Where poles are carefully selected and painted, and where conditions permit them to be installed at boundary walls and fences, there may be no objection to their use, or certain sections of the system may be on poles with the remainder by underground cables. The best form of construction, however, expense permitting, is with underground cables either in conduits or with cables of the "Parkway" type. This applies not only to light and power but to telephone and to low-tension equipment as well. All underground cables must be sheathed with lead in addition to the insulation.

With the use of underground conduits, splicing pits are required, approximately 300 feet apart, and the conduits must be laid to grade and in straight lines, to permit the drawing in of the cables. When a lead-sheathed cable is served with flexible steel tape armor, it is termed "Parkway cable" and may be installed in a shallow trench without further protection. "Parkway cable" is usually less expensive than underground cables in conduits; splicing pits are unnecessary, and the cable may be obtained and laid in single lengths of from 1000 to 2000 feet, depending upon the size. The cable is laid approximately 15 inches below grade and may follow the contour of the ground, avoiding rocks, trees, etc., without difficulty. Where splices occur, they are made under lead and protected with cast-iron splicing boxes.

Service Connections. A small private lighting plant may furnish direct current in conjunction with a storage battery. While standard lamps and heating equipment of the proper voltage will operate equally well on either direct or alternating current, motors must be selected for the voltage and current on which they are to be used. The public service company in general will provide single-phase alternating current for lighting and heating at 110-volt, two-wire service for small installations, and at 110-220-volt, three-wire service for large installations. The three-wire service is to be preferred, as it is more economical in the use of copper. Power may be delivered over a two-phase service generally at 220 volts. Where two- or three-phase service is not available, however, the company will provide single-phase service for power. While single-phase service is satisfactory for lighting and heating, and for the operation of small domestic motors, where large motors are to be used, particularly for the operation of elevators, two- or



Underground Service with Transformer in a Fireproof Vault in a Country House

three-phase power service should be obtained where possible. In general, the company will terminate its lines and transformers on a service pole located on the public right of way adjacent to the property. Secondary service wires from the transformers to the building may be on poles, or underground in conduit, or in a trench with "Parkway" cable.

Service wires and cables on private property, whether on poles or underground, must be provided at the expense of the owner. Where the distance from the service pole and transformer to the center of distribution does not exceed some 300 or 400 feet and the load is not heavy, the transformers may remain on the service pole, and the service may be delivered to the buildings at the secondary voltage. However, where the distances are great and the load is heavy, supplying power, heating, cooking, etc., with dependent buildings, a transformer vault should be considered at the buildings or at the center of distribution, and the current should be delivered to the transformers in the vault at the "primary voltage" of 2300 volts, as this permits the use of small copper for the service lines and provides for almost unlimited extension of the service at small expense. The vaults are constructed at the expense of the owner, as are also the service cables on the property. Transformers are furnished and maintained at the expense of the public service company. A transformer vault may be in the basement of the main building or in an adjacent dependent building, or it may be of the subway type, outside and flush with the ground. Vaults must be of brick or cement, approximately 36 square feet in floor area and with full headroom. They must be ventilated, fitted with 6-inch curb at the door, and with Underwriters' doors and locks. Vaults must be so located that transformers may be removed and replaced conveniently. Primary connections are made in the vault, while service switches and meters must be installed outside the vault and in the basement space. Before planning the wiring layout, the public service company should be notified as to the estimated connected load in kilowatts for lighting, power and domestic services, and the point of service determined as well as the character and voltage of the current to be supplied. The rules and requirements of the company should also be obtained and followed in the planning of the work.

Metering. The method of metering will depend upon the local requirements of the company, which may permit the use of a common meter for all services at an equitable rate, or may establish separate rates for power, lighting, and heating, etc., which may necessitate the use of two or more meters. In planning the service switchboard it is advisable to allow separate risers for lighting, for heating, and for power, each with a separate meter loop, thus permitting the use of one or more meters as required. Where dependent buildings are scattered over large areas, it may be of advantage to meter on the primary side of the transformers and distribute to the different buildings at high voltage.

Power Sources. Where possible, the electric service should be obtained from the public utility companies' lines, as a constant source of power is thus assured, and the capacity is practically unlimited. Where this is not available, power may be obtained from a private plant on the premises, operated by steam, oil engines, water power, or by the small gasolene-operated generating sets with storage battery, such as have been developed for farm lighting.

Steam Engines. While steam engine-driven generators combined with storage batteries may be developed for residence lighting, etc., such a plant is scarcely practical for work of this character, as it requires a high-pressure steam boiler, and a skilled fireman or engineer who must remain on duty in the boiler room when the engine is in operation. In many sections a licensed engineer is required by law.

Water Power. Where water power or water right is available, and where there is sufficient head and water storage to supply the demand, a small hydroelectric plant may be developed by the use of a water turbine, regulating and generating equipment, together with storage battery as auxiliary to the generating plant. The development of such a plant, however, would prove expensive, and its successful operation would depend upon the electrical demand, the distance between the residence and the dam, and the available water storage facilities to carry the service over the dry months.

Oil Engines. Where the electrical demand and load are heavy, and where cooking, baking, water heating and laundry equipment, elevators, etc., are to be electrically operated, the use of an oil engine with storage battery, will prove satisfactory. These units may be obtained in almost any size, are economical in the use of oil, and may be located or housed at any location on the premises. They require little attention, and it is unnecessary to keep watch in the engine room while the engine is running. In practice, the engine plant would be operated for a certain time during the day or evening when the demand is heavy, at the same time charging the battery. The battery will maintain the service when the engine is not running. The design of such a plant should include an engine and a battery large enough to carry the peak demand on the system.

Gasolene Engines. Where the electrical demand is small, and the connected load for lighting and power, including flat irons, toasters, percolators, refrigerator, and like equipment, does not exceed some 6000 watts, the small self-contained "farm electric lighting plants" will give satisfactory service. These units may be operated with either kerosene or gasolene, may be obtained in capacity ranging from 800 to 1500 watts, and where the greater capacity is required, two or more units may be hooked up together, or separate units may be installed in different buildings. The units operate in conjunction with a storage battery and may be fitted for automatic operation, wherein the generator keeps the battery charged, and current is supplied by the battery.

HEATING THE COUNTRY HOUSE

BY
P. E. FANSLER
ASSOCIATE EDITOR, THE HEATING & VENTILATING MAGAZINE

THE matter of heating equipment for the country house revolves around considerations of bodily comfort for the occupants rather than about considerations of low first cost. Daily, by telephone and by letter, I am being asked for recommendations regarding heating plants for new houses or for installation in some beautiful old home, and almost invariably the request is followed by: "I don't care what it costs,—I want the best equipment in the market." And my rather intimate contact with this particular field leads me to the conclusion that this condition is only now beginning to develop, and that American standards in the air conditioning of homes will rise rapidly until what we now accept as satisfactory will appear crude and unscientific. I have used the term "air conditioning," because the mere supplying of warmth to the home during the heating season will not satisfy the exacting requirements of the home owner of tomorrow. Research has determined the proper quality of air for optimum comfort, and no man who spends his days in an office where properly conditioned air is furnished and who sends his children to modern schools will be content until his home likewise provides every facility for bodily comfort.

Radiant Heat the Elementary Form. Primitive man utilized heat in the form of radiant energy;—that is, he built a fire and warmed his body from its radiance. This would be important only as an historical item were it not for the fact that British research of today suggests the use of radiant energy as the most efficient means of heating the modern house. This is contrary to present-day practice, but the finger of scientific research points, and it cannot be ignored. The home of today is heated by filling it with warmed air. There are two ways of raising the temperature of the air,—direct and indirect. The former uses the "hot-air" furnace, and the latter a boiler and radiators. The term "hot-air" really is a misnomer, as air excessively heated is objectionable. In the modern warm-air system the air flowing from the register is merely tempered, and the code of the National Warm Air Heating Association sets 175° Fahr. as maximum permissible register temperature. Where a boiler is used, water is heated or turned into steam which is piped to the different rooms, where in radiators its heat is transferred to the air, largely by convection, heating the air in the rooms.

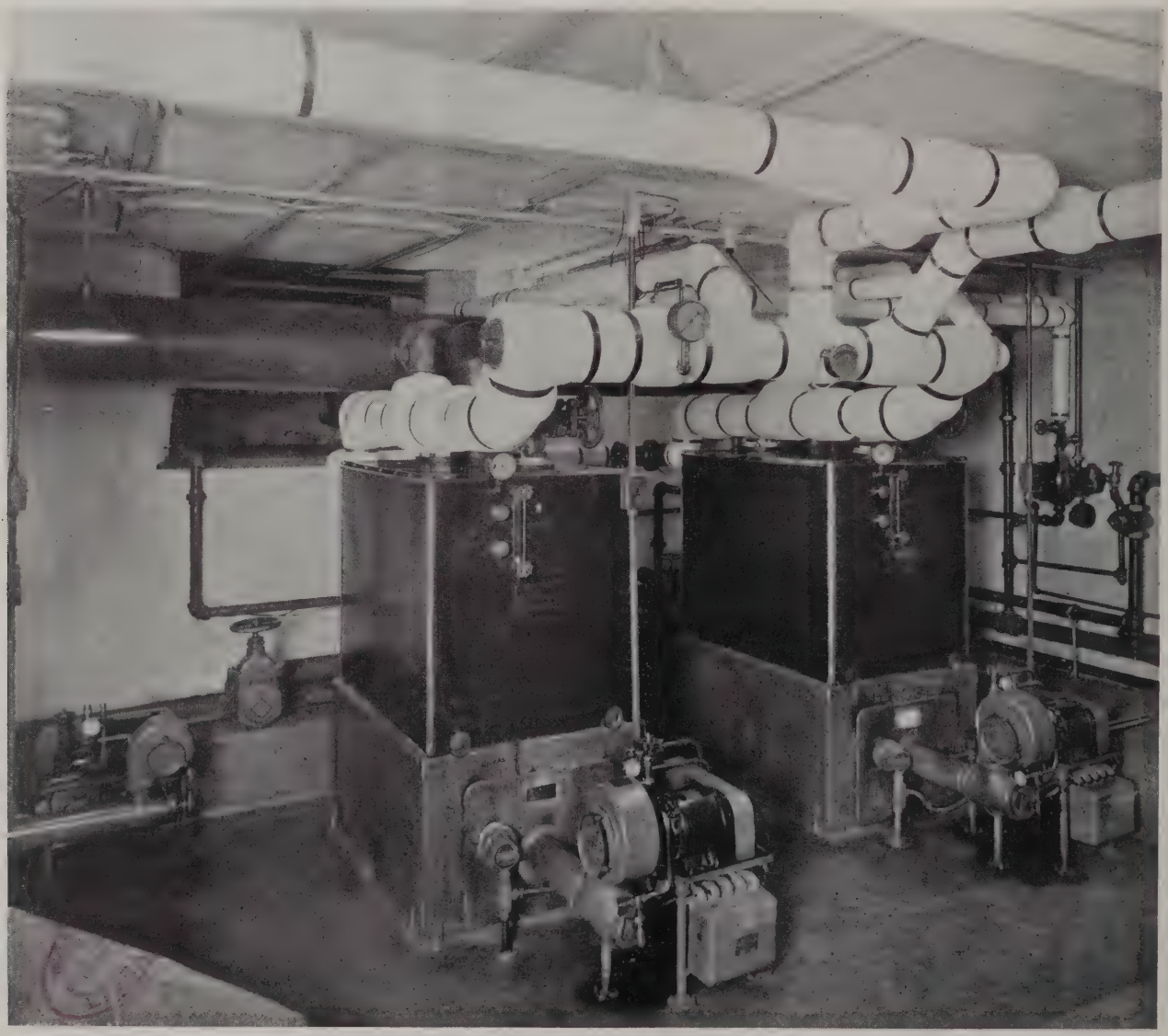
Warm Air Heating For The Large House. In the past, warm-air heating has been used, almost without exception, in the small house, and even here its application has not been any too successful. This was due almost entirely to poor engineering. Furnaces were little more than glorified stoves surrounded by sheet-metal jackets, with "efficiencies" of the order of 25 per cent. Those who installed warm-air systems probably knew little or nothing of the engineering principles involved and, from the technical standpoint, duct systems were faulty, inadequate and improperly disposed. Then, too, such systems operated entirely on the basis of the tendency of warmed (and hence lighter) air to flow upward, and the infiltration of cold air into certain rooms effectually counteracted the emission of warmed air from the registers, so that these rooms were almost always cold. Admittedly this is a gloomy picture, but it represents actual conditions in many homes.

A few years ago, however, the industry centering around the manufacture of warm-air furnaces and equipment awoke from its lethargy, and presently there came a new regime that, even now, threatens to encroach upon the field hitherto held sacred to the application of boiler-and-radiator heating, for even the largest and most costly homes. Two factors alone almost entirely account for the changed conditions. About four years ago the National Warm Air Heating Association appropriated funds with which to build and maintain a research laboratory at Urbana, Ill. This is a typical medium-sized American home, and in it, since its completion, there has been carried out a continuous scientific and engineering study of warm-air heating. Professor A. C. Willard, head of the School of Mechanical Engineering at the University of Illinois, was selected to direct the lines of research, and it is not too much to say that he has become the Moses who has led this industry out of the wilderness and to the high technical plane that it is now beginning to enjoy. Results of the injection of technical and scientific knowledge into this field are already evident. Furnaces are being designed with due regard to engineering principles, and it is not too much to anticipate equipment with efficiencies as high as those representing the best practice in the boiler field. Design of duct systems is rapidly being improved and standardized, and furnace installers are being schooled in refinements hitherto unthought of. The second factor in developing warm-air heating, especially in its application to large houses, is the introduction of small electric motor-driven blowers to force the warmed air through the ducts regardless of wind or weather conditions on the outside of the houses. The oil-burner, vacuum cleaner, washing machine and electrical refrigerator each helped to prepare the public for acceptance of a similar small motor in the warm-air heating system. Now, instead of the air's circulation being left to chance, it is under definite pressure and control, and that cold northwest room gets its full quota of heat even in

the most extreme weather. I have gone into this seemingly extraneous subject at some length because the architect who specializes in large and costly houses has many times had a contemptuous attitude toward warm-air heat and, if my deductions are correct, he should revise his estimates (in the light of this new engineering development in the warm-air field) and be prepared to give his client the benefit of the most improved equipment.

Another point is that manufacturers of warm-air furnaces have, almost without a single exception, adopted a rating code, developed by the National Warm Air Heating Association, and their products are marked with guaranteed capacity ratings determined by a technician employed by the Association. This is in marked contrast to the situation in the boiler-heating field, where the manufacturers have been wrangling over ratings for more than a quarter of a century, and thus far, for commercial reasons, practically refuse to adopt a uniform rating code. As a consequence, heating contractors are completely at sea when it comes to determining the actual capacity of a given boiler, or to comparing performances of one with those of another.

Practically there is no limit to the size of a house that can be heated with warm air where a blower is used. As an example, a residence in the outskirts of Indianapolis is 130 feet long and has 24 registers. Two furnace units are fired with oil burners; there are two sets of ducts, one conveying warmed air from the furnace jackets to the various registers, and one returning the cooled air to the furnaces. The return ducts to each furnace are fitted with a motor-driven blower which provides such a circulation that an 80° temperature can be maintained in every room in zero weather with a 35-mile wind. The introduction of the blower has solved the problem of distributing warm air through the long or large house. Without a blower it is customary to introduce the warmed air into the room along the windward side, so that the excessive infiltration due to winter winds would tend to distribute it through the

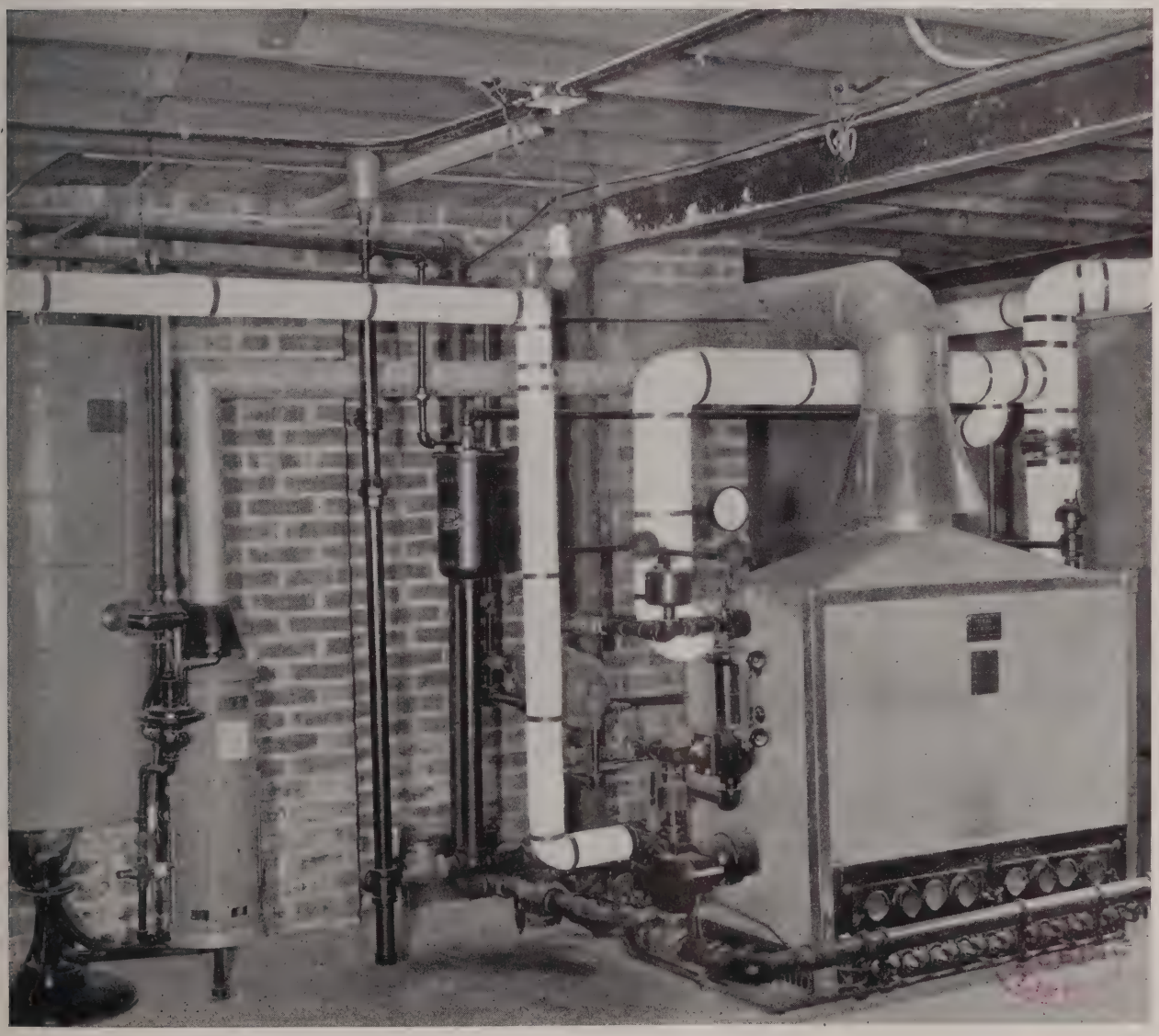


The Installation of Two Boilers Permits Operation at High Efficiency Under Varying Weather Conditions, and Provides Against Breakdown of Service

house. But high winds and shrinking window sash defeat this purpose, as the natural force producing air flow is small indeed. With a fan installed in the heating system of the house, as was just described, the furnace could be located in the extreme southern end of the building and the flow of air to the northern extremity would be definite and sufficient all the time.

The Basis of Successful Air Conditioning. Research, conducted over a period of more than five years by the American Society of Heating and Ventilating Engineers, in coöperation with the Bureau of Mines and the U. S. Public Health Service, has determined the atmospheric conditions under which human beings are most comfortable. It is not sufficient that a person be warm enough. It is essential that the air be within certain extremes of temperature; that the humidity be properly related to the temperature, and that a definite air movement, in rate related to the other two factors, be maintained. These three variables can be so plotted as to define a "field of comfort," through the approximate middle of which passes the line of greatest comfort. Thus a definite humidity and rate of air movement go with each degree of temperature, and the proper combination, for a temperature of 60°, results in a more comfortable atmosphere than where the temperature may be 70° and the humidity too high or too low, with little or no air movement.

Having this knowledge of the conditions under which atmosphere is most comfortable, it becomes a problem in air conditioning to have these conditions automatically maintained in the country home. It then remains to see just where each type of heating equipment fits into the general scheme of things in producing the desired atmospheric condition. Where all of the air is heated in a central unit, it becomes a simple matter to provide for the introduction of water vapor to the desired extent, and this is one of the strong points of the warm-air system. The commonly accepted method is to incorporate a pan, with large surface area, in the jacket design, with



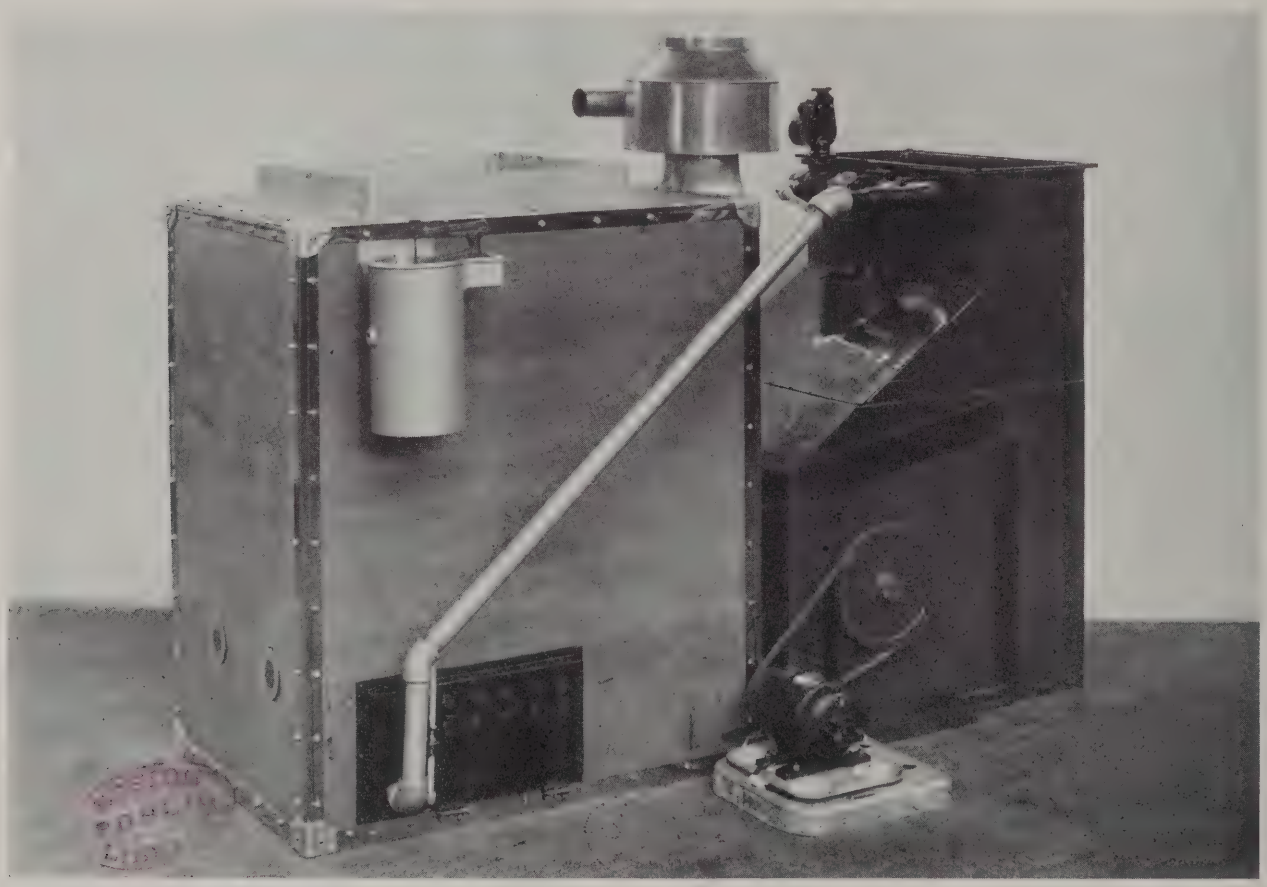
The Gas-fired Boiler and Domestic Water Heater in a Country House Comprise an Excellent Installation Where Clean, Automatic Operation is Desired

a water supply from the street with mains automatically fed to the pan and maintained at a fixed level through a float valve. The pan is so placed that the heat in the combustion chamber raises the water to practically the boiling point, and the air, passing over the surface of the water, picks up the water vapor and thus provides the requisite humidity. This scheme is not entirely satisfactory, even in small units, because it is difficult to evaporate at a sufficient rate properly to humidify even a six- to eight-room house. With the fan-blast system, however, it is not difficult to introduce a spray device that will raise the humidity of the air to the proper degree.

The Air Washer. Another reason for the increasing importance of the warm-air system is the ease with which the air being circulated throughout the house can be cleaned. Dirt is one of the bugaboos of the best built houses. If it can be removed from the air flowing to the fan and furnace, the air coming from the registers will be clean, as well as warm. There are several kinds of dry air-washers adaptable to the house with forced-air circulation.

The last item in the category of warm-air attributes is that of providing for the definite air movement required to meet ideal conditions. With this kind of circulating system, the air can be removed at just the proper rate to provide at once for the heat loss in any room and for the desired air flow that prevents the air stagnation found in many houses. So it will be seen that, by virtue of the changes that have come about in the warm-air industry, this form of heating is, in many ways, admirable for the large country house. The chief objections are prejudices resulting from observance of the inferior warm-air installations of the past and the feeling that these plants are "cheap" in the accepted sense of the word. While speculatively built houses are frequently equipped with trashy warm-air equipment built for competitive selling, the architect will find furnaces built to the highest standards and adapted to homes of almost any size and value. This whole field is so new to the architect who does not specialize in small commissions that he is likely to look askance at it; but the points that I have brought out are sound, and warm-air heating is destined to make its appeal to the owner of the large country house.

Heating With a Boiler. The "heating industry," so-called, has drawn a clean line of demarcation between boiler and furnace heating. The former class of installations is put in by a steamfitter; the latter by a sheet-metal worker. These two classes of artisans being separate and apart, and the metal-worker usually also being the local tinsmith and plumber, the two groups have grown up apart and almost hostile. This situation is illogical, and within the last few months a definite move has been initiated to segregate the trades involved in the so-called "com-



A Gas-Fired Blower Type, Warm-air Furnace Automatically Provides Proper Temperature, Humidity and Circulation of Cleaned Air, Giving an Almost Perfect Atmosphere

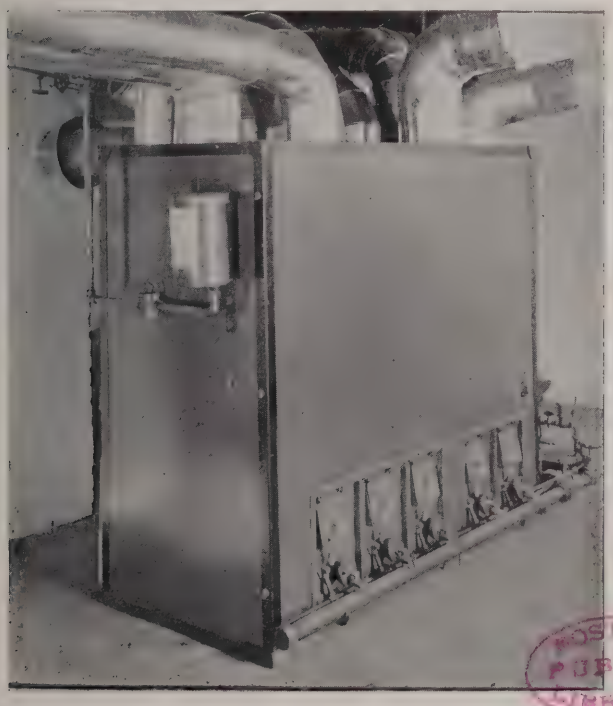
bination shop," as they do not really belong together.

The earliest boiler heating utilized steam as the medium of heat transfer from boiler to radiator; the hot-water system was a later development. For many years the use of steam involved practically a one-temperature medium, for water boils at 212°, at atmospheric pressure, and at a but slightly higher temperature with the pressures used for heating in systems other than the "vacuum." This was the chief objection to the early steam-heating installations,—radiators were filled with steam at the same temperature in October and May as they were in December and January. It was almost impossible to prevent overheating in the early and late days of the heating season.

Water systems possessed one admirable attribute; they could be operated at low temperatures,—120° to 150°,—when the heat demand was low, and at maximum temperatures,—180° to 200°,—during the coldest weather, although, owing to the lower temperature of the heat transfer medium, larger radiators were required than with steam. They had also two opposing characteristics,—they were sluggish in starting up to respond to a sudden demand for heat, but, on the other hand, the system contained a considerable quantity of stored heat and consequently did not "pump" rapidly from hot to cold. One curious thing about a steam system is the psychological effect of a cold radiator upon a person coming into the room from the outside. If the radiator, through operation of a thermostatic control, has had the steam shut off for a few minutes, the average person entering a room at 70° will, finding the radiator cool, complain that it is uncomfortable.

Modern Multi-temperature Steam Systems. With the one-temperature characteristic of the old steam system admittedly against it, engineers developed various schemes to so modify steam-heating systems that they would not suffer, in this regard, in comparison with water installations. These schemes were all based on the principle that water under pressure requires a higher temperature to turn it into steam than when at atmospheric pressure, and that the boiling point is lowered by producing a vacuum, or negative gauge-pressure, in the boiler and radiators. A lower limit of about 100° and an upper limit around 240° (for a steam pressure of 10 pounds) afford a range considerably greater than that of a water system, and the pipe and radiator sizes can be materially reduced. On the other side of the ledger there is the necessity for providing and maintaining the equipment necessary to produce the desired conditions of vacuum and pressure.

The Problem of Maintaining a Vacuum. It is extremely difficult to install a heating system so that it will be absolutely air-tight. In a steam-heating plant, if the steam pressure is removed suddenly, a vacuum will be formed, and air will be drawn into the pipes and particularly into the radiators. If, at the end of an hour, the steam is restored, steam will flow from the boiler to a radiator and, because of the compressibility of the air in the radiator, steam will press the air into one portion of the radiator until a state of equilibrium is reached. But, as steam and air will not mix, one part of the radiator will remain cold and the rest, under the influence of the steam, will give off heat. If it had been a vacuum system, the air would have been drawn from the radiator as it slowly filtered in, and a definite vacuum maintained. Then, when steam was permitted to flow,



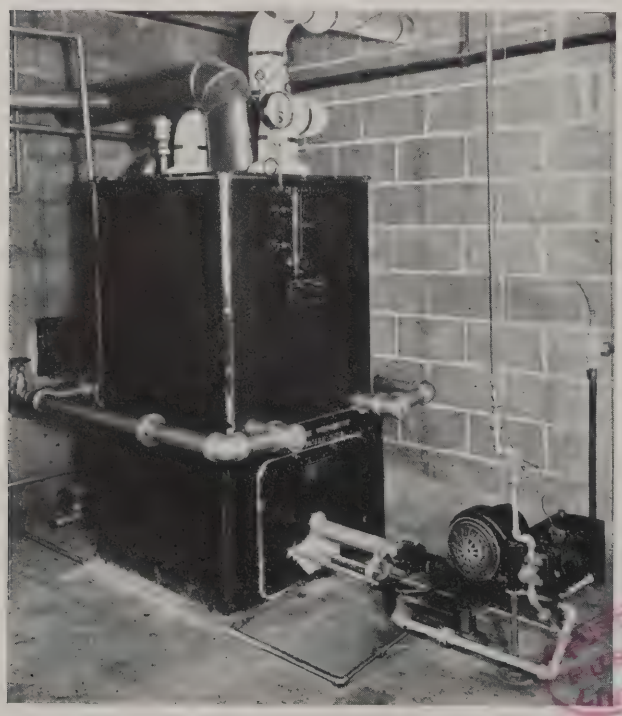
Simplicity and Cleanliness Characterize This Gas-fired Warm-air Installation

Combustion Chamber and Secondary Heating Surface Separated for Increased Efficiency

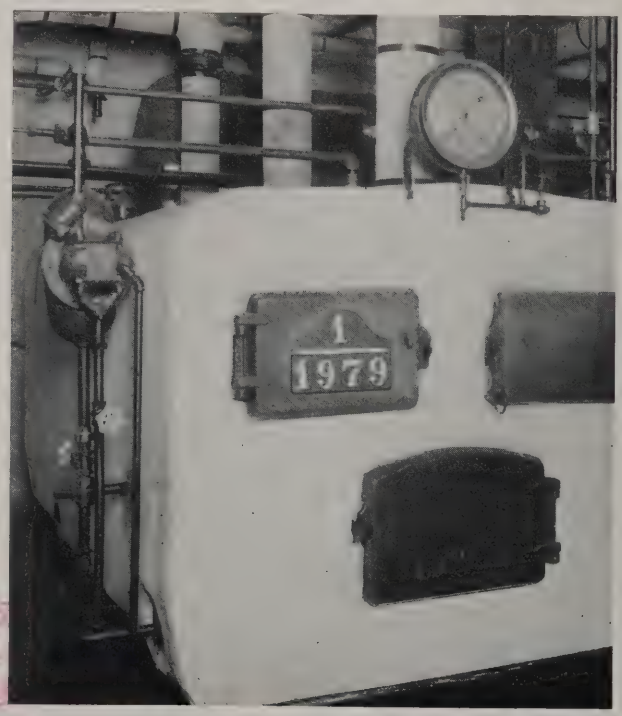
the radiator would have been completely filled with steam, and its entire surface have become effective.

There are two methods of producing and maintaining a vacuum. One involves the use of a mechanical device, such as a motor-driven pump that will return the condensate to the boiler and eject the air. Such a system is hardly suitable for the country house, and properly belongs in hotels, apartment houses, or other large buildings. Non-mechanical devices for maintaining a vacuum are many, and depend upon different principles for their operation. Properly made and installed, these devices entirely change the characteristics of the old basic steam-heating system, and produce systems of marked flexibility. It is but natural that a secondary advantage of using wide-temperature range systems is to produce real economy in fuel consumption. Although, as I have pointed out, economical operation is not the most important thing in the production of a uniform room temperature with a minimum of attention, no home owner will pay two dollars for what can be secured for one dollar. Consequently, while taking many statements of economy due to the use of advocated "systems" with a grain of salt, the architect should carefully examine the validity of such claims, in the interests of his client. As a matter of fact, after having developed wide-temperature range systems for the purpose of securing better operation when but little heat is required, engineers have taken the next step and produced systems designed automatically to generate and distribute a heating medium at a rate and temperature exactly proportioned to the existing differences in temperature between the outer and that desired in the home. Such a "differential" system would appear to be the last of the possible refinements in this regard.

Basing Heat Generation on Temperature Differences. It has been determined that, when the "daily mean temperature" as given by the U. S. Weather Bureau, is 65°, the datum line exists, above which no indoor heat is required, and below which heat is demanded. It would, at first thought, appear that this is too low a figure, but it simply means that at this temperature, which is the mean of the highest and lowest temperature during the 24 hours, the daytime temperature is sufficiently above that figure, so that the indoor air will be comfortable. Thus it is evident that the demand for heat can be measured by the differences between the existing daily mean temperature and 65°. If, for instance, the daily mean for a given day is 60°, we can say that the demand for heat during that day is (65°—60°) 5° times one day, or five "degree-days." Had the daily mean been 55°, the demand would have been ten degree-days. Had the daily mean been 60° for five consecutive days, the demand for the whole period would have been 25 degree-days. We then see that it is possible to so design the control equipment of a heating plant that heat will be produced when the outdoor temperature drops below 65°, and in proportion to the difference between 65° and the lower temperature. The supply is not strictly in proportion to the *degree-days,* which are based on *mean* and not instantaneous temperatures, but the principle is similar. Obviously, such a system operates best where a fluid fuel is used, street steam, electricity, gas or oil, because, in this case, the production of heat stops when the temperature is such that no heat is required. Where coal is burned in such a system, the production of heat is reduced to a



A Boiler Designed for the Use of Gas or Oil Fuel Only



Constant Water Level Is Maintained by Device at Left

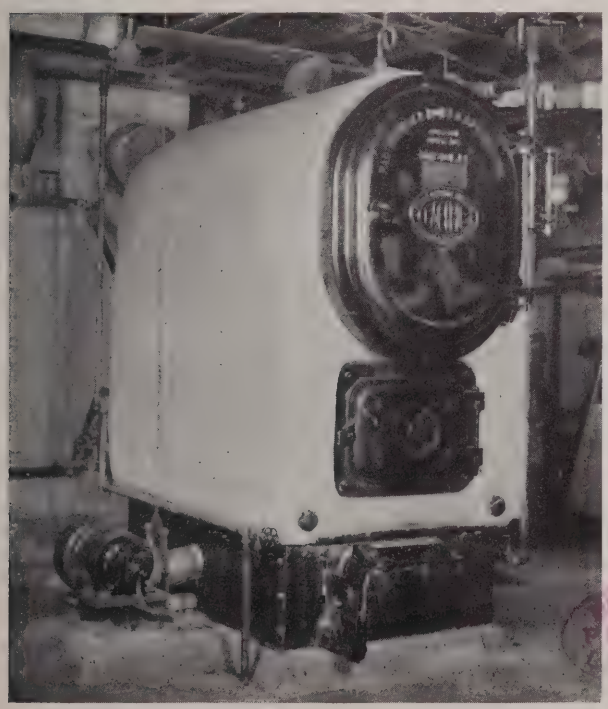
minimum; i. e., the fire is put in a "banked" condition.

So far as the actual production of heat is concerned, such a system is ideal, as it brings about the generation of heat only when it is required. The operation of a differential system would generate steam or vapor at a very low temperature,—around 100°,—when there was but a slight demand for heat, by causing the system to function at a high vacuum. If a cold snap were coming on, the vacuum in the system automatically would decrease as the outdoor temperature decreased, filling the radiators with steam at higher temperatures. If the outdoor temperature should approach the minimum for which the system was designed, the vacuum might be entirely removed, and steam be generated at positive pressures, so that steam at 220° could fill the radiators and cause them to emit heat at a maximum rate.

Boilers for the Large House. Fortunately for the architect interested only in large homes, there is not the cut-throat competition in boilers adaptable to his needs as is the case with boilers for smaller houses, particularly those of the round type, and in furnaces. For the large house the choice would lie between rectangular cast-iron boilers, steel boilers, and special types designed to burn gas, if the owner desired to use this ideal fuel. In considering the first two classes, the architect should select a boiler with a generous secondary heating surface or flue area, because of the increasing popularity of oil as fuel. It might be desirable to switch from coal to oil at some future time, and a boiler deficient in secondary heating surface is not the boiler to use with oil, for the reason that the oil burner is designed to generate heat intermittently, at a high rate, and the short travel of heated gases at high temperature simply means a high chimney temperature and consequent low efficiency. Gas heating is also coming into great favor, but it can seldom be used in a large house unless insulating materials in walls and roofs are used to minimize the heat losses, and weather stripping and storm windows are installed to cut down infiltration. Gas-heating boilers are comparatively easy for the architect to select because of the uniform rating code adopted by manufacturers of these boilers and because such ratings are certified to by the American Gas Association, in whose research laboratory in Cleveland tests have determined the ability of the boiler to carry its designated load as well as to function properly.

Steel boilers, in the past, have found more general use in hotels, apartment houses and schools than in residences, but the field has been rapidly extended to include domestic applications, and now the "bungalow type" of boiler, small enough to pass through a standard door, is available for the smallest house. These boilers have much to commend them,—high efficiency, quick-steaming ability, and unit construction. That they are encroaching upon the former domain of the cast-iron boiler is evidence of possessing inherently good qualities.

Boiler Protective Devices. Boiler operation in the large house usually involves different considerations from that in the small house, as it is in the hands and under the control only of servants. For this reason it becomes a necessity to provide against accident through carelessness. This is particularly true where steam is used, as there is constant danger of cracking a section or of burning the top of the combustion chamber because of failure to maintain the proper water level. A simple device to automatically assure



The Blower at Left Furnishes the Draft Necessary Where Small-sized Coal Is Burned

Automatic Stokers Lessen the Labor of Firing Coal Furnaces and Boilers in Country Houses

Steel Boilers Show High Efficiencies in Country Houses as Well as in Industrial Power Plants

a fixed water-line consists of a chamber in which there is a metal float that opens and closes a valve in a pipe leading from the water main. Developed from the crude device of several years ago, these feeders now provide against corrosion due to hard water, have self-cleaning valves, and such refinements as make for reliable operation. More and more is the home owner, with or without servants, coming to depend upon automatic devices to obviate the necessity of remembering to do certain things at definite times, and this is true particularly with reference to the heating plant. Both gas and oil have been used as domestic fuel for a quarter of a century, but it is only within the last few years that the completely automatic heating plant has been brought well nigh to perfection. These fuels, particularly oil, have cut into the sales of coal to such a degree that coal interests are alarmed, and coal dealers all over the country have been forced, for self-preservation, to begin the marketing of oil. One reflex to this tend has been the development of automatic methods of firing solid fuels.

Stokers for Domestic Applications. A provision for the mechanical feeding of coal to a domestic boiler or furnace, and in some cases for the removal of ashes, affords some small measure of relief for the owner of a small home, or for the servants in the larger house. There are really two considerations as regards fuels: the mechanical firing of common sizes of coal, and the ability to use, in the domestic heating plant, the smaller sizes of coal hitherto used only in large commercial or industrial plants. The rice, pea and buckwheat sizes can usually be bought for about one-half the price of the conventional domestic furnace coal, and where the annual consumption is 25 tons or more, the difference in fuel cost is appreciable. A more universally applicable benefit comes from the fact that these automatic firing devices make it possible to approach the higher economies obtaining with fluid fuels by adapting the firing rate to the heat demand. With a hand-fired plant under thermostatic control, the beginning of a sudden cold snap will be followed by the opening of the draft and closing of the check damper, but with a given supply of coal in the combustion chamber, the charge is liable to rapid consumption, even to the extent of almost complete reduction to ashes. With the stoker plant, the demand for increased heat is followed by a slow but uniform supply of fuel, maintaining the fire in almost ideal condition, regardless of the length of the excessive demand. In most cases, of course, it is necessary to fill the hopper by hand, in contrast to the industrial plant, where overhead storage makes automatic gravity filling a simple matter. Also, it is necessary to remove the ashes, although some of the devices convey it to steel cans, and the manual labor is limited to the removal of these cans.

After having dwelt at length upon the desirability of having properly conditioned air in the home as well as in the school, theater and office, it would not be amiss to point out that several forms of equipment for this purpose are already on the market. One of these is a single-unit, gas-fired, warm-air furnace, with an integral humidifying device, and it is automatic in operation. It occupies no more bulk than the conventional boiler for any given building. If desired it can be arranged to provide for the circulation of cooled, dehumidified air throughout the house during the summer. In truth such apparatus supplies ideal atmosphere for the home, summer and winter, making it actually more comfortable during the summer to keep the windows and doors tightly closed than to have them open. Naturally, the demand for this class of equipment will stimulate the ingenuity of engineers and designers, and it is not too much to predict that such unit plants will be common, even in small homes, ten years hence. The architect will do well to give serious thought to this question of air conditioning, as he will be faced by a demand for an ideal atmospheric condition in the home from men who are educated to its appreciation through enjoyment of what has been termed "manufactured weather" in their offices and in theaters and motion picture houses.

THE SERVICE EQUIPMENT OF THE COUNTRY HOUSE

BY
ELIZABETH C. CONDIT
PRATT INSTITUTE

HOW to provide convenient workrooms, adapted to the service to be done, is becoming a basic problem for the architect of country houses. Traditions no longer overbalance practical considerations in affairs that affect the business of the household and its management. The kitchens, pantries and other household workrooms should be large enough to facilitate the work to be done, but they cannot be as huge as the rooms in our grandmothers' houses.

Careful consideration of these several points will aid in planning an efficient kitchen and services for the country house:

(1) That the plan contributes to efficient work;

(a) that the services be arranged compactly for comfortable and convenient routing of work; and that they are

(b) completely equipped with useful, easily cleaned, labor-saving tools.

(2) That the materials used shall be easy to keep clean and sanitary, with all surfaces smooth and washable.

(3) That the service portions are attractive, comfortable places in which to work. This can be accomplished through wise choice of materials and colors, and an orderly arrangement.

The kitchen should be large enough to be a convenient place where food for family and guest can be prepared, but its exact size will depend upon the number of workers or people using the room, as well as upon the number to be served. A room 8 by 12 feet or 9 by 13 feet is convenient for one worker. A cook and assistant for a larger country house will need a larger room, and the efficient kitchen must be supplemented by a service pantry, servants' sitting and dining room, lavatory, and storage and receiving space. Where the kitchen must be used as a servants' living room as well as a workroom, it should of course be large enough for the dual role. A room constructed with an alcove to be used as servants' dining and sitting room, will give the staff a place out of the cook's way, thus avoiding trouble. If the entrance for tradesmen and supplies is made large enough to receive market products and groceries, with space for a table or counter with weights and the quipment needed for checking, the kitchen will be relieved of many disturbing occurrences. The housekeeper's food storage closet can conveniently open from this receiving room.

In planning the service portion, both the arrangement of the major equipment and the routing of the work to be done in the room must be considered. Windows, doors, chimneys and outlets should always be placed to conform with step-saving arrangements. In a well ordered, step-saving plan of work, the cook collects at the work-table the needed supplies from the refrigerator nearby and from shelves within arms' reach. The utensils and tools are also within arms' reach of the table; across the kitchen is the sink. Supplies collected easily are made ready for cooking at the table, which is only a few steps from the range. When the food is cooked it is placed on a shelf in a pass window to the serving pantry. The waitress in the service pantry places it on the serving dishes, adds garnishes,—and it is ready for the dining room. The cooking dishes are collected on the right hand drainboard of the sink, where they are washed and put back in their places near the work-table. Towels and holder and dish cloths are put in a clothes washer connected with the kitchen sink, where water and electricity cleanse them. The dishes from the dining room are washed in a dishwasher connected with the service pantry sink and are kept in closets over that work-table. Obviously, the work in the kitchen centers about the preparation and cooking of food and the washing of the dishes used in preparation, while that done in the pantry is concerned with the serving of the food and the washing of the service dishes. Since water is needed for both the kitchen activities, the sink is well placed on one side of the room opposite the range, work-table and refrigerator. In a large kitchen a work-table at the center of the room may be a convenience.

Storage Space. Enough wall cabinets, shelves, floor cabinets and closets to adequately care for the variety of equipment and supplies, make for orderly work. Portable or built-in, ready-for-use units can be procured, or a work-table and shelves be built as an integral part of the room. The essential factors are adaptability, arrangement, position and convenience. The cook should have supplies and equipment within arms' reach of the work-table. Wall shelves just wide enough to hold spice, flour, sugar, etc. containers are better than wide shelving. Compartments built like pigeon holes, suited in size to hold rolling pins, egg beaters and other equipment, are also conveniently placed against the wall, near the work-table. Well constructed sets of hooks under shelves where hanging things will not be knocked down or obstruct work, are practical and useful for many small tools.

As far as space and convenience will allow, it is well to arrange shelves and cupboards the height of the natural range of the eye. Closets under tables are difficult to clean and less likely to be carefully inspected. Built-in or attached containers, with spaces back of them, or with cracks and crevices where they slide back and forth, are to be avoided. A few crumbs or a little food left in a corner can cause untold trouble as harbors for germs or vermin. A closet for the pots and kettles can be narrow, ex-

The Use of Decorative Accessories Adds Much to the Attractiveness of This Kitchen

tending from floor to ceiling, placed near the range. Storage for mixing bowls and kitchen dishes is convenient in wall cabinets near the work-table or in a closet at the left of the sink. A linen closet, fitted with shelves close together for towels, etc., can be wherever there is space. The convenience of a separate closet for these things will do much to encourage cleanliness. An electric mixing machine can be placed opposite the refrigerator or quite near the work-table.

Over the work counter in the service pantry, closets protected by glass doors offer convenient places to keep glass and china, while a well constructed, built-in-the-wall safe, fitted with narrow felt-lined drawers for flat silver and large compartments for the silver service dishes, cares for the silver. These, with a linen closet, give storage place for things needed in the service pantry. Accessible markets and prompt deliveries make it unnecessary to buy large quantities of provisions, and a large, stocked storeroom no longer means economy. However, a small, well ventilated storeroom, opening from the delivery entrance, is useful. Wall and center shelving affords ample space to keep emergency and permanent stocks of foodstuffs. Cleaning equipment, reagents and supplies need not be housed in the kitchen, but in a well constructed closet in a place convenient to their use. In a large house it is convenient to have such a closet on every floor. Outlets to use for the vacuum cleaner may be needed in places where no other electric device is used. As a rule, the vacuum can be plugged into any light socket. Work-tables and closets can be made of well seasoned hardwood, constructed to leave no seams or cracks, or of metal. A smooth, firm table top gives a good working base. There is a variety of materials to choose from. Because of the work to be done, non-absorbent material,

Photo. Mattie Edwards Hewitt

Kitchen Cabinets Conveniently Arranged Are Aids to Efficiency

which is not affected by either acid or alkali and is easily cleaned, is desirable. The best is none too good and will prove economical in the end. There is a tendency to put in the kitchen poorly constructed labor-saving contrivances that are an extravagance because they are difficult to clean and make instead of save work. Bound corners, smooth surfaces and open, easily cleaned spaces are aids to cleanliness.

Refrigeration. The refrigerator near the work-table should be large enough to serve the family, and a size too large is better than a size too small. One with two compartments allows space to separate different kinds of food, or the family food from that of the servants. If there is to be a refrigerator in the service pantry, that in the kitchen need not be so large as when it is the only cold storage space. In these days of gas and electric refrigeration and available market facilities, large built-in storage refrigeration is seldom necessary, but it is often advisable to incorporate a standard refrigerator in its proper place with the cabinets and shelving. A mechanical refrigerator for salads and desserts can be fitted under the work counter in the service pantry, if floor space is limited.

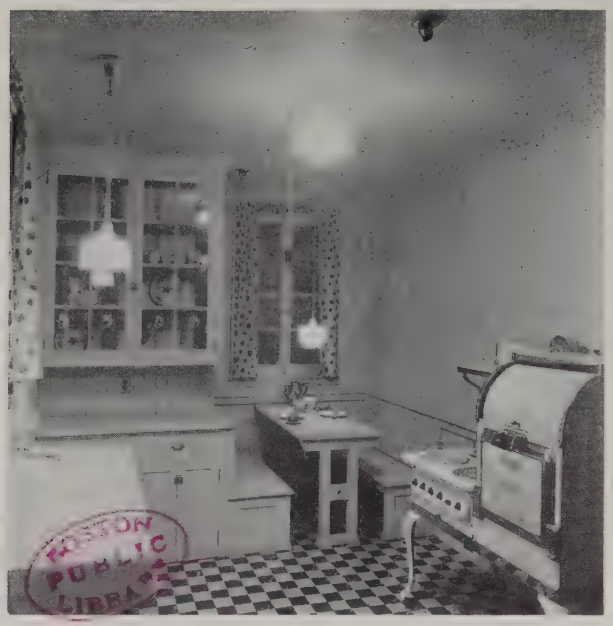
Range. A range should be placed so as to follow the natural order of work. Many kitchens are equipped with coal, gas, oil or electric ranges, depending on available fuel, cost of maintenance and efficiency as determining factors. If an ash-chute is attached to carry ashes to the cellar, where coal is used, it is an aid to the cleanliness of the kitchen. A gas range with a smooth metal top provides cooking conditions more like that of the coal range than does one of the barred top variety. A continuous metal-top electric range prevents the water that boils over from affecting the electrical connections. Which-

Photo. Mattie Edwards Hewitt

Color and Decorative Design Are as Fitting in the Kitchen as Elsewhere

Photo. John Wallace Gillies, Inc.

A Well Planned Working Corner in a Kitchen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Lighting Units Are Arranged Properly for the Worker

ever variety of fuel is used, a range that is simple of design is more easily kept clean. A warming oven and a temperature control on the oven are useful additions, and are integral features of many of the best ranges. A two-oven range makes it possible to have food baking at different temperatures at the same time. A hood over the range to carry off the odors of cooking, or a flue from the gas oven, is a small matter when building, but it makes a large contribution to the comfort and pleasant atmosphere of the house. Another small detail of importance is the size of the service gas pipe. The usual 1-inch service pipe is often inadequate. A 2- or 3-inch service pipe means sufficient gas at all times, and assures the working of the oven temperature regulator.

Sink. A kitchen sink built with two drainboards and made of sanitary material,—porcelain, enameled iron or vitreous china,—should be provided with a combination faucet for hot and cold water and be placed under a window, opposite the work-table and range. It will be comfortable if it is set the right height, 35 inches from the floor to the working bottom of the sink for workers whose height ranges from 5 feet to 5 feet, 6 inches, or 36 to 38 inches from the floor to the rim of the sink, for a worker somewhat taller. Many a worker's discontent is the result of unnecessary fatigue from working at too low a sink or table. A small electric clothes washer under the right-hand drainboard of the kitchen sink and an electric dishwasher in the same position in the service pantry are labor-saving devices. Other electric conveniences such as toasters, percolators and plate warmers are used in the service pantry, where enough electric

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Photo. Mattie Edwards Hewitt

Gas Range with Hood. Metal-topped Work-table and Sink

outlets should be provded over the work counter.

Incineration Garbage Disposal. The country house should be equipped with an incinerator to eliminate use of unsanitary and unsightly garbage cans. Small waste containers clamped to the drain pipe of the sink, swing out to receive waste from the sink drainer, to be burned in the incinerator. The incinerator can be placed in the kitchen or in the cellar. Gas, coal, oil and wood are the fuels used. A well constructed flue connection is absolutely necessary for the escape of odors and to produce combustion. This should be tested in all weather and winds, and, if necessary, provided with a fan. The opening where the garbage is put into the incinerator should be of a convenient height to receive the emptyings from the container.

Floors and Walls. The rooms where food is cared for are the most important to keep absolutely clean and sanitary. The kitchen floor should be smooth, grease-proof, easy to clean, resilient and non-slippery. Attractive floors can be provided in patterns of tile, linoleum or rubber. Resilient floors are usually preferred, as they are the least tiring to the workers. The walls may be painted with washable oil paint or enameled in better work to a height 6 feet, or fully tiled. Colored tiles are used with excellent effect. The baseboard and the wainscoting should be flush with the wall, without any dust-collecting ledge. A coved base between floor and wainscoting is more easily cleaned than sharp corners. Rounded door and window trim is also desirable for the same reason. Where waterproof walls and flooring are used, a floor drain facilitates a thorough flushing of floors and wainscoting with a

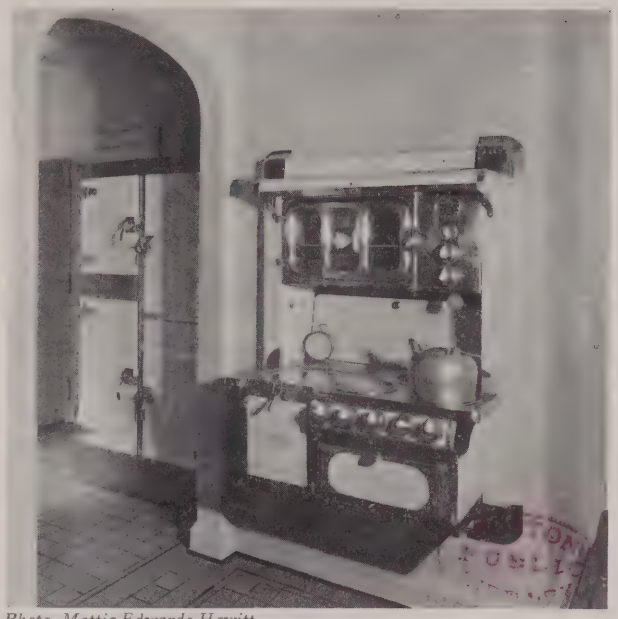


Photo. Mattie Edwards Hewitt

Modern Electric Ranges Have Many Automatic Control Features

Photo. Amemya

Adequate Range, with Ventilation. Ice Water Faucet near Door

Photo. Mattie Edwards Hewitt

Convenient Built-in Cabinets and a Dining Alcove Are Included in this Compact Kitchen

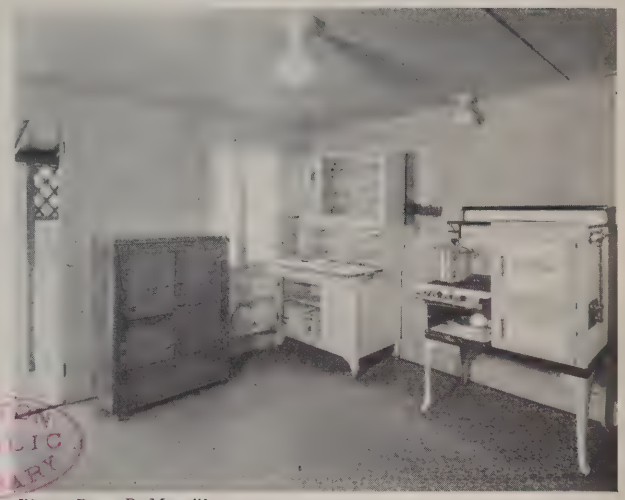


Photo. Dana B. Merrill

The Well Lighted Working Kitchen Cabinet is Here Placed Near the Refrigerator and the Range

hose, using hotter water than is practical for mop or scrub brush cleaning.

Laundry. The laundry, wherever situated, should be conveniently and adequately equipped. Laundry work in the modern country house is now done almost entirely by machinery. The clothes are washed most efficiently and thoroughly in washers of various types, the moisture is removed by "extractors," and the clothes are dried and ironed by other apparatus. Drudgery is eliminated. If the room is large enough, washer and laundry trays at the center of the room are advantageous. Tubs should be set 36 inches from the top rolled rim to the floor to make the work of washing less back-breaking. The easiest tubs to keep clean are white or cream with vitreous finish. Whatever kind of a washer is chosen should be set with permanent drain and faucet connection. A small gas stove, wheel table and wall table are needed for washing clothes. Over the wall table shelves for stain removal and reagents will be convenient to use as the clothes are sorted before laundering. The same table will serve for sprinkling the clothes and as a receptacle for the ironed clothes. An ironing board built to fold up to the wall when not in use, is protected from dust and out of the way.

Bars where the electric iron cords can be hung away from the danger of being wet, and a place to keep the irons, should be provided. Science has not yet devised a clothes dryer that equals the sun as a bleacher and sterilizer, although there are many kinds of excellent dryers on the market. It is most important that this room should be well lighted. Give as much sunlight as possible, with center ceiling artificial light, supplemented by wall brackets near the washing and ironing centers. Electric outlets for irons, washer, etc., are necessary.

Light and Ventilation. The lighting and ventilation of a room are related, because the placing of the windows affects both. It is of the utmost importance to have the working centers well lighted. One authority says a kitchen should have the total glass area of its windows, outside door and transom equal to at least one-fifth of its floor area. Where windows are set high enough, 50 to 52 inches from the floor, the sink and work-table can be placed under them. The electric lights should illuminate work, not cast the worker's shadow upon it. There should be a kitchen unit for general lighting, a local light at the sink, and a pendant light over the table. Closets should be equipped with center lights, as well lighted spaces are seldom left dirty. It is in dark corners and shut-in places that dirt collects unseen to menace health and comfort. Whatever ventilating system is installed, windows and doors will contribute their share. It is well to arrange windows, transoms, and doors to allow a cross current of air to prevent cooking odors from being carried into the house. An electric exhaust fan can be used to good effect. Cold air on the range affects the cooking temperature and will cause a gas or oil flame to smoke. If the outer kitchen door is a Dutch door, the upper part can be open while the lower half acts as a screen to protect work-table and range from direct air currents.

Use of color in kitchens is in danger of being overdone, and the builder is warned to plan the color scheme for this room with consideration of its effect upon the workers. Too much strong color is as tiresome as the old glaring, white kitchen. The choice of a neutral colored sink, pale green or autumn tint is recommended,—a tone that will harmonize with any tint in the trim. The trim can be repainted at little expense, but a new sink is a costly affair, if the color scheme is to be changed. The exposure of the room should of course influence the color used. It is important that the household workrooms be well lighted, comfortable and pleasant. The workers may not appreciate the influence of the color and arrangement, but it plays a part in making them contented.

BUSINESS RELATIONS WITH COUNTRY HOUSE CLIENTS

BY
C. STANLEY TAYLOR

FROM the architect's point of view, country house work can be the most profitable of any type of commission which may develop in his office. Generally speaking, experience has not proved this to be the case, but in almost every instance the fault lies with the architect's business relations.. There is no reason why a client should pay less than 10 per cent for work of this nature; first, he can afford to pay it; second, the architect cannot afford to do the work for less if he is to render the proper kind of service; and, third, this commission represents a real, paying investment from the client's standpoint, provided the work is well done and serves to create real value.

The most prolific cause of non-profitable or unsuccessful country house planning projects lies in the careless approach to the matter of ultimate cost. If he is capable, the architect need not worry about matters of design, but if the cost of his project exceeds the owner's budget, a condition of unpleasantness is permanently established. This does not mean that the owner may not ultimately spend much more than he had originally planned on doing, but he will do it with full understanding and of his own volition. It is the mystery of home building which annoys clients,—unexpected costs arising toward the end of construction,—bills for extras which were never really understood, and the uncertainty which lack of proper explanation always causes. Perhaps there is a rigid rule which can be applied to every country house project,—that explanations should be made *before,* not *after,* the fact. If the architect will adopt this policy, he cannot fail to give satisfactory service, and incidentally, to make a good profit on the fees received. If a non-profitable project is analyzed, it will be found that the profit has been expended largely in explaining or making plan changes to suit the client. The architect cannot make extra charges for this type of work, and consequently he should avoid it by better preparation. An hour spent in advance explanation may save days of drafting room costs, not to mention disappointment and loss of confidence on the part of the client.

Country house clients are most exacting in their contacts with architects. They demand a degree of skill and a full measure of personal service consistent with the quality and nature of the projects. The average country house client is at once both appreciative of excellent work and critical of any weaknesses, shortcomings, or lack of service which may be discovered in those whom he may employ. Perhaps the most important and difficult of these factors is the demand for the personal attention of the architect to every detail of design and construction. This type of client takes the attitude that he is paying well for expert services; he is impatient of delays and of any seeming lack of attention, and is frequently unwilling to have the architect's authority delegated to representatives or assistants unless in turn these associates of the architect demonstrate their ability and capacity for understanding the client's problems.

Necessarily, country house clients are fairly well to do, and whether they have possessed their fortunes for generations or have recently acquired them, they are usually thoroughly businesslike in their financial transactions and usually watch expenditures as closely as an investor or merchant. This does not mean that they are unwilling to spend money or that they are parsimonious, but it does mean that they are able to judge values and expect a full measure of return for every dollar expended. These considerations are worth bearing in mind when seeking and dealing with country house clients. for upon the architect rests not only a very great responsibility for the successful conduct of the design and building project, but an equally great opportunity for enlarging his clientele and for creating a residence that will increase or more firmly secure his own prestige.

Securing Commissions. The first business problem in country house practice is that of securing commissions for such work. Perhaps to a greater degree than in any other form of architectural practice, country house projects are obtained through either social or client channels,—that is, either through personal acquaintance with the prospect or through the recommendation of past clients who have been eminently satisfied with the architect's services and capabilities. There is little value in solicitation of such projects, a matter which must be at once apparent upon realization that the country house project is something of a temporary avocation for the owner rather than a business investment. The owner's first thoughts are expressed among his friends with whom he discusses their own building experiences, the features that they incorporated in their own houses, and the architects and builders they employed to carry out their ideas. The owner thinks in terms of social rather than business relationships, and the architect who is socially acquainted with the prospective client and is welcome at his home has a distinct psychological advantage over the architect with whom the owner is not acquainted, even though the latter is more competent and better equipped to carry out the project. Prestige, of course, counts for a great deal among people of wealth, and it is very true that architects of the highest prestige totally unacquainted with a prospective country house owner may be asked to undertake the work without there having been any previous contact and without there being any apparent channel which brings the two together, solely because the client wants a well known name connected with his project, for the same reason

that his wife wants to wear a gown with a genuine Paris label. In other words, country house projects are secured largely through (1) acquaintanceship, (2) direct recommendation of mutual friends or clients, or (3) through prestige. Solicitation, if employed at all, must be of an indirect nature utilizing some intermediate channel.

Fees. With a country house project in view, the next business problem the architect faces is that of establishing a fee and securing a suitable contract for the work. To a considerable degree the charge established by the architect is of less importance to the owner than a knowledge of his capacity to carry out the project capably. The very forces that bring the architect an opportunity to undertake the work are more influential in securing him the commission than the price of his services. If a client seeks the architect on the basis of his prestige, he is willing to pay whatever the architect charges without question. If the contact is purely social, the owner is seldom willing to negotiate for a lower fee than the architect proposes to charge. One important matter, however, is the fact that such owners quickly appreciate whether an architect is worthy of his fee and whether or not he is establishing an unduly high charge as compared with the compensation received for other similar projects. Hence, the fee problem is largely in the architect's hands, but the intelligent method of establishing a fee is to disregard the opportunity for making an exorbitant charge and to base the compensation strictly upon the nature of the project, the amount of work involved and the quality of service to be rendered. In an article in THE ARCHITECTURAL FORUM for August, on "Payment for Architectural Services," this matter was discussed in some detail, and it appeared to be the prevailing opinion among architects that fees should be based upon the individual project rather than on an empirical formula or standard percentage.

Services to be Rendered. In drawing up the contract, however, it is of vital importance that the client be fully informed as to the nature and extent of the services to be rendered by the architect, the owner's obligations and responsibilities, and the architect's functions and the limit of his responsibilities. Loosely worded contracts, implying that the architect will give constant supervision to the project, will lead to trouble unless the architect intends to personally visit the site daily. Any implication that the architect will control costs or produce a house of given character within an established limit of expenditure is dangerous in the extreme, unless the architect intends to hold himself responsible for doing exactly that thing. The contract should be clearly and fairly worded, establishing definite limits upon the responsibilities and obligations of both parties without intimations or vague phrasing that may be construed to the disadvantage of either.

Cost Limits. In spite of the statements in the beginning of this article, the third business problem generally surrounds the matter of cost. Country house clients are not very different from other clients in their usual lack of appreciation of the cost of building materials and building construction. They frequently establish in their own minds total expenditures which they consider adequate for the development of their proposed estates. Subsequently, unless they advise their architects of these limits and request their coöperation in keeping all expenditures within the budgets, they may request accommodations or adopt suggestions of the architect and carry the ultimate costs far beyond their original conceptions. Sometimes such a development of expenditure is entirely satisfactory to the client, if he feels that the accommodations he is obtaining are exactly what he wants and that the prices charged are fair. A case in point is the instance of a wealthy owner who purchased an old Connecticult farmhouse and remodeled it for his country estate in a very comprehensive manner, employing old time construction methods and materials so that the extensive additions and improvements were in full harmony with the original building. Subsequently, the structure was so satisfactory that the architect was commissioned to carry out all of the furnishings and decorations, lest the owner introduce some inconsistent element which would destroy the happy effect. At the start of this project, the architect was warned that he would be hung from a high limb or otherwise held personally accountable if the total expenditure exceeded $60,000. So successfully was the project carried out, however, that as the owner's interest developed and his ideas expanded, the subsequent cost reached $250,000 to the complete satisfaction of the client, whose enlarged viewpoint now embraces the development of many extraneous features, including a swimming pool, formal gardens and other features which will require a still further outlay. Such an ideal condition, however, is not always encountered in such work, and even this project would not have gone so smoothly had not the architect taken care to advise the owner during the development stages that changes approved or required by him would involve a substantial increase in the original allowance.

At this point an important statement may be made. It is always possible to determine costs in advance, at least within a very small percentage, so that a budget may be established. It is found highly advisable to segregate completely the cost of ground improvements and of furnishing and decoration. In other words, the architect should primarily undertake the designing of the building itself, and it should be clearly understood by the client that the costs referred to have only to do with the building. Let the matter of ground improvements and of furnishings and decorations be another project, for which a general budget may be established, but which will not become specific until the house is nearly finished.

Considerable time should be taken in the preparation and correction of sketch plans, until they have been thoroughly approved by the owner with the understanding that any changes he may authorize will

cost considerable money and that the approval must be forthcoming in writing. When the building has been brought to an approved sketch plan stage, it will be found that local contractors can give very close estimates. These estimates should be taken as based on the sketch plans and fairly well detailed specifications. The costs should be submitted to the owner, together with the architect's fee and a *contingency amount*. There always are contingent costs, and it is better to put them into the picture before than after. By taking the intermediate figure of the various contractors' estimates and adding the architect's commission and adding a contingency fund, which usually should be about 5 per cent of the estimated cost, a figure is established which is a real budget and which it is unnecessary ever to exceed except under the owner's direction for additional work. This type of project resolves itself into a comparatively simple business relationship. Many an architect makes serious errors because a project is started in a somewhat haphazard manner in order to get the work going in the office. Any serious-minded country house client knows that he must pay for what he intends to get. He cannot accomplish unusual economies; he cannot expect his architect to do this. Consequently, he should not be led to believe by statement or by inference that he can get more for his money than anyone else can. If he wants more than he can possibly get, it is good business to tell him that he must reduce the size of space required or the quality of construction and equipment. It will be found that this kind of a business approach in the early discussions will establish a type of confidence which will carry through the entire project. Then, if the owner decides to build a larger or a better house or to install convenience or luxury equipment beyond the first conception, he automatically decides to spend more money, and he should be called upon to authorize this in writing.

The base cost having been arrived at, as already explained, these additional authorized expenditures can be recorded so that at no time should the matter of ultimate cost be mysterious, and at no time should it be necessary to explain this cost *except before commitments are made*. Homebuilding *is* expensive,—everyone knows it, and no owner will long be blind to this fact. It is obviously better to clear up this situation in the beginning. If at the end of the work the owner has spent a little less than he has been led to believe it will cost, he is the architect's friend for life, and he will go out and get more business for him. If the reverse condition is true, he will go out of his way to stress the unpleasantness of his relationship with his architect.

Supervision. The fourth business problem develops during the construction stage when the owner expects close supervision of every detail of the construction by the architect or some competent representative. Not only is it desirable to have a resident clerk of the works, but the architect should establish a regular schedule for inspection and should keep the owner fully informed not only of this schedule, but of the developments which he finds at each visit to the site. There can be no argument or criticism if the owner knows in advance what he may expect of the architect in the form of field supervision, unless the architect fails to maintain the established schedule and deliberately neglects his obligation.

Changes. The fifth, and probably the most troublesome, business problem arising on country house work develops during the finishing stages, when the owner is closely concerned with the selection of finishing materials not included in the general contract and often not discussed in detail as to either cost or type when plans were being drawn. It is at this stage that the owner begins to see in physical form the home which he attempted to visualize from sketches and blueprints. Many changes are likely to be made at the owner's request, and these changes almost invariably result in extra charges by the contractor. Many of these changes are ordered verbally by the owner when inspecting the work with the architect. The significance of these changes in terms of cost may not be fully appreciated at the time, and they may mount up in total to an amount which the owner is quite unwilling to pay when the bills are presented. The careful architect will not only immediately confirm these orders in writing to the owner, as well as to the contractor, but will wherever possible secure an estimate of the cost before it is too late for the owner to save the extra expenditure by reverting to the original plan. In practice this is most difficult to accomplish on every detail, and toward the end of construction there are many finishing items which represent unauthorized extras. The architect is responsible to the builder for most of these extras, and he usually has to submit the bills to the owner after the work is completed, with explanations and justifications which will result in the owner's acceptance of the charges. No element in architectural practice is usually so troublesome or so unpleasant as straightening out costs of such extras, and the happiest results are always obtained when this work is reduced to a minimum or entirely eliminated by taking great pains to have all work orders approved by the client in advance. Occasionally a country house client gives the architect carte blanche for the expenditures necessary to produce the desired results. While, apparently, this simplifies the problem of charges, it imposes even greater responsibility upon the architect to see that the bills are fair and correct and that they are no higher than they must be to accomplish the necessary work. Thoroughly businesslike methods are imperative in country house projects. It is a fatal mistake to assume that because a client is wealthy or because he is spending a large sum of money, he is indifferent to how much is spent or what it goes for.

After completion, the sixth and last problem of relationship which architects encounter in country house work is the neglected matter of following up completed construction. We have already noted that

country house projects are obtained largely through social channels and through the friendly recommendation of past clients. This suggests very forcibly the desirability of making certain that a client is not only a friend but remains satisfied with the work accomplished. The close contact or friendship that often develops between the architect and the client during the course of an important building operation is one that need not be abruptly terminated upon completion of the work,—in fact it is far better if the business relationship can be restored to or established upon a social basis when the work is done. There are several reasons for this,—the first being the selfish reason that the architect's interests in obtaining new work are not so readily forgotten by the client and he, therefore, may prove to be a more fertile source for new work than is likely to be the case if the architect himself drops out of the client's notice. A second and even more powerful reason is that the continued relationship assures the architect that no difficulties will arise after the occupation of the house which justly or unjustly may be attributed to some fault of the architect. Very frequently minor flaws appear, such as cracking of plaster, the warping or shrinkage of woodwork or floors, or minor defects in plumbing or heating systems or other items of equipment. Almost invariably these troubles are not due to neglect on the part of the architect, but are inherent in the materials themselves or might possibly be due to defective workmanship, which was not discovered by the architect's supervisor during construction. If the client once gets the idea that his subsequent troubles are in any way blamable upon his architect, he may come forward and call for an explanation or adjustment, but very likely he will simply put it down as poor work and will hesitate to recommend the architect to other friends, due to these trivial matters. The best practice seems to be for architects to make a point of visiting every building they complete at regular intervals for several years after their work is terminated, simply to raise questions regarding the condition of the structures and to answer questions concerning maintenance and care of the buildings. Such action pleases the client immensely; it entirely removes the possibility of there being continued dissatisfaction.

Photo. Paul J. Weber

Proper Landscaping Is Essential to Country House Architecture
House at Whitinsville, Mass.
Joseph D. Leland & Company, Architects

LANDSCAPING THE COUNTRY ESTATE

BY
JOSEPH FRADLEY WHITNEY
LANDSCAPE ARCHITECT

TO fit a piece of land for affording the utmost in human use and enjoyment is the object of landscaping. To achieve this goal, organization is necessary, and this in the case of estate planning means that the various uses to which such grounds are subjected must be recognized and adequately prepared for. The units resulting from an analysis of uses fall into three main divisions: the private (the enclosed lawns, terraces, flower gardens and the like); the semi-public (those portions visible to the passing public); and the service (the garage and garage court, laundry yard, vegetable garden, auxiliary buildings and sheds); and then each division is related by its position to the corresponding divisions of the house. Thus the influence of the room arrangement and the orientation of the well considered house extend out into the grounds and indicate, sometimes quite definitely, the position of each of these three outdoor divisions. As this arrangement is gradually evolved it should be borne in mind that restfulness should be the keynote of the average estate development. Broad lawns of gentle contour will give just this effect. That lesser element of restfulness, the satisfaction of the senses, felt in a garden which is a riot of all colors, is also important, but in a different way.

Selecting the Site. The owner of a country estate asks invariably to be satisfied on four points. He wants (1) easy access to his house; (2) attractive views of it as he approaches; (3) comfort and a sense of security upon reaching it; and (4) pleasing prospects from the rooms, terraces and the porches. This means that there must be worked out on the grounds directness of approach; road grades under 10 per cent, if possible; no sharp turns; and one or more carefully planned views of the house as seen from the approaching road. It means, furthermore, that the house should stand in an area sufficiently large to give it a stable appearance, since a very narrow terrace or a sudden dropping of the ground away from the house will destroy the sense of security as surely as does a position buffeted by gales or within reach of the waves. It is absolutely essential that the building platform drain easily. This is a point often neglected, as usually insufficient data are taken on existing soil and topographical conditions, the assumption being that a little grading will overcome all difficulties. Neglect of this point, in one case with which I am familiar, involved the prolonged use of a steam shovel. To arrange a good view is an easy matter, but to bring it into the picture without damaging vegetation or topography is often difficult, for the sides of an opening do not "feather down" where there is a lack of undergrowth and where it must be planted. This requires skill and experience, as does also the selecting of a small picture of importance from a broad mediocre view. Screening unpleasant vistas is another matter, in which a knowledge of plant forms and habits is essential.

Disposing of Excavated Material. When the site has been selected, it is most important that a landscape plan be prepared in order that the soil excavated may be placed, without rehandling, in its permanent position. The time lost in rehandling is often more important than the extra expense involved, as in the case of a delayed planting season, where it means holding over certain plantings for almost a year and others for four or five months. Delayed lawn planting, especially, is a serious inconvenience. It is taken for granted that the loam will be stripped off all areas marked for grading so that it may be replaced when the final grade is established, since good loam is frequently scarce and generally costly.

Protecting Important Trees. The possibility of saving important trees in a filled area by the use of "tree wells" is a widespread fallacy. The tree lives often in spite of the well rather than because of it, for it frequently holds excess water that is harmful to the tree. Its only virtue lies in its keeping the soil and the tree's bark apart. The more approved method of protection where use of fill is inevitable is in trenching around the feeding roots which lie under the outer edges of the foliage, as a rule, and in putting in some manure to stimulate root growth. At approximately the old grade, a line of unglazed tile or a 6-inch layer of gravel or broken stone with occasional outlets to the surface is used in order to bring air and water to the roots at the original level and to give an opportunity for occasional liquid feeding. Some trees, like elms and willows, will stand several feet of fill without adverse effects, and on the other hand I have seen a beech, that Beau Brummel of trees, show the harmful effects of a 4-inch fill and die under 12 inches after living a hundred years with roots partly exposed. It is best to seek advice of an expert where a good tree is involved, and the expert must be carefully chosen,—not merely a self-styled expert.

Roads. Except in the case of farm roads, which will not be discussed here, it is usually desirable to have the main approaching driveway enter the property as directly as possible, so that those entering may lose sight of the public road quickly. When there is clear indication from what direction will come the traffic destined to enter, a road entering at an angle facilitates driving to a great degree. The smallest radius of a turn-in should be 20 feet on center line unless traffic in only one direction is planned to be served. The narrower the public road or the busier it is with traffic, the wider the turn-in should be,

A Well Designed Approach, Forming an Easy Angle with the Highway

Restful Effect Obtained by Broad Sweeps and Few Simple Accessories

because of the difficulty of swinging out before entering. It is always pleasant to get a glimpse of the house from a distance soon after entering the property, even though it be lost sight of again, but any change in direction must be made gradually, especially if the house has been seen and its location established, for noticeable indirectness is irritating. Every curve should have a *raison d 'etre* that is evident, whether it is a natural curve such as to avoid a group of trees or a declivity, or a created obstacle. Notice how often the inside of a curve in a road is planted. It is more inviting when the house is reached to get a view into an angle rather than to look onto a corner or toward the end of a wing. The diameter of the turn-around at the house should not be less than 60 feet from the center line to center line. This should be considered a minimum, for any increase will make driving easier with less danger of overrunning the edge of the sod. It is customary to widen a single roadway at the house entrance to 15 feet or more, or else to provide, within sight, a place for the parking of several cars.

Where usefulness alone is the controlling factor, no road should be less than 8 feet wide. On turns where the radius is less than 40 feet, the width should be increased to 10 feet or more, for the reason that the rear wheels of a car cut inside the front wheels as much sometimes as 2½ feet when the car is making its shortest turn. Double roadways should have a minimum width of 14 feet. Usually any driveway between 10 and 14 feet in width is not advisable, because it is unnecessarily wide for a single and not wide enough for a double road. A discussion of actual road construction will be omitted, except to suggest that a road of much lighter construction than is customary will adequately serve the purpose during the summer months, where it would go to pieces if used during a winter thaw or when the frost is coming out of the ground.

Separation of Forecourt and Garden

Garage Courts and "Y's". Garage courts should be 35 feet in depth, if possible, for ease of entrance and exit. In plotting the route of a car backing out of a garage, use a 20-foot radius on center, and remember that the front wheels of a car cannot be cramped until the car is about 8 feet out of the garage. In the case of a "Y" turn, the length of the "Y" should be almost the length of the car, and the width 10 feet or more. These conditions will permit a change of direction with only one backing. The garage or service court is easily separated from the other portions of the grounds by walls or fences, and proper planting. One of the most effective, and at the same time pleasing and unobtrusive, types of fence for such purposes is woven-wood, made of small sapling pickets wired together. It secures the requisite privacy and screening without the heavy or forbidding aspect that a solid wall might have. Its material blends naturally with the landscape.

Planting is used to define and divide areas of different uses from one another, to give background to important features, to screen unpleasant outlooks, frame good views, deaden noises, and in general to tie together all objects and areas in one unified whole. Broad lawn areas are laid out and surrounded by planting, trees are placed to frame pictures and to cast cool shadows, and buildings are surrounded by sufficient planting to overcome any bare, isolated aspect and to emphasize their important features.

Where a building depends upon its picturesque irregularities for part of its interest, all its angles

A Quiet Pool with Wooded Background Gives Play to Light and Shade

Pleasing Vistas Are Possible in the Gardens of Large Estates

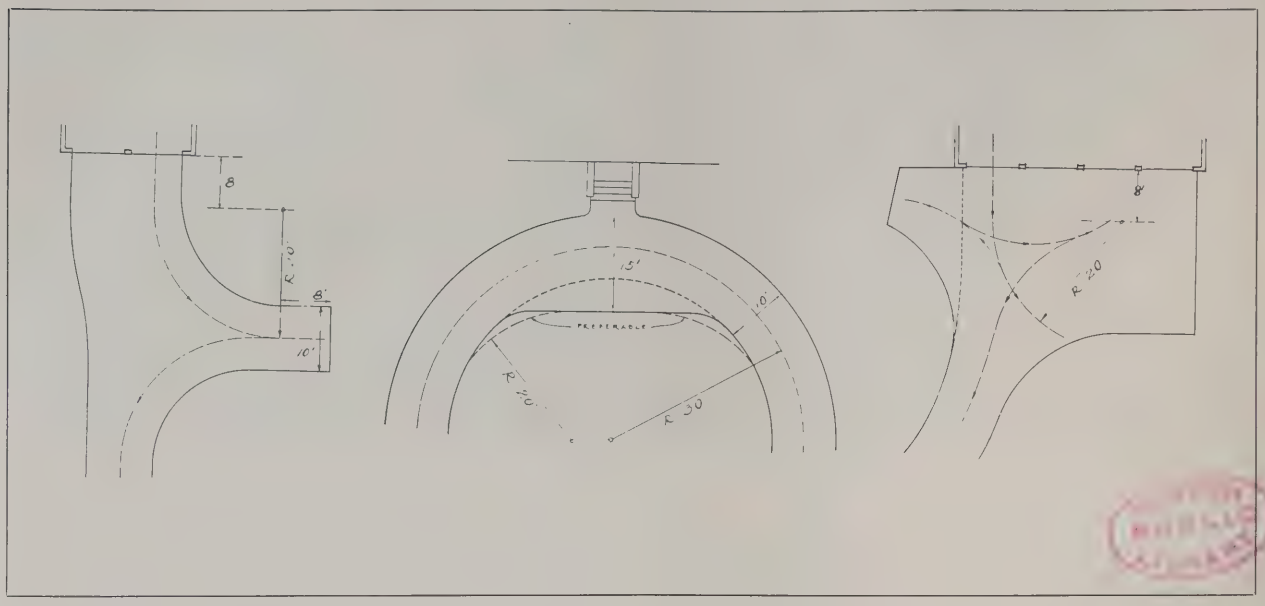
should not be filled with planting or it will become less interesting. Many buildings have the appearance of having had all the plants in sight swept neatly against their walls. This effect defeats the purpose of planting, which is to make the house look at ease in its setting as well as to distinguish it. The necessity for planning the foundation plantings before the building is erected may be illustrated by one instance. In a recent project the only logical position in which a large shrub could be placed to screen a laundry yard from the entrance road was found to be directly on the top of a dry well which had been thoughtlessly located, and which could have been placed elsewhere. Frequently do areaways, underground drains and pipe lines come in the most inconvenient places in relation to landscaping, and this is usually true of outside hose connections and roof leader connections, which should not be placed where the heaviest planting will be necessary.

The amateur in planting always runs to extremes in the use of verticals, for the reason that the planting is thought of as an end in itself and not as a part of a general composition. It is therefore as conspicuous as the plant forms permit. Several lessons are learned by experience,—among them, that rounded forms are mellow and that vertical forms are best for accent. Too many verticals destroy the accent effect, and "if the salt hath lost its savor, wherewith shall it be salted?" Another and a very important point is that except in the case of a garden or parterre, the shape of the planting bed has very little significance. It is the shape of the area left after the planting is done that should have thought.

The garden does not often occupy the most conspicuous position, for reasons already given, and also because it is not so pleasant to look at continually as a broad lawn. It is usually placed where it is at least partially visible, however, so that the glimpse that one gets will lead to a closer inspection. If it is in close proximity to the house, it is built up on an axis of the house extended, with beds and paths so arranged that they will offer the most attractive views from the terraces and the overlooking windows. But whether it is close by or at some distance away, it should have a well defined enclosure and a definite center of interest, and whenever possible, a background of good trees. The arrangement of beds, and the selection and use of colors are matters of personal taste and skill and demand a fund of technical knowledge. Beds that are too small prevent an effective massing of colors and increase the expense of maintenance; beds that are too large put many of the plants out of convenient reach of the gardener. The sizes of the beds should be governed somewhat by the ease with which the innermost plants can be reached, a free-standing bed being made as wide as 12 feet without making necessary a concealed path inside. Combinations of colors are legion, and everyone has his own pet schemes. It might be noted, however, that large masses of brilliant colors may make a garden garish without making it bright, while brilliant colors scattered throughout will give sparkle. It might be noted, too, that many admirable soft color combinations go to pieces under a bright sun.

Pools. Inasmuch as pools often form the centers of interest in gardens, a few points about their construction might be mentioned. Formal pools, with which the architect usually deals, are often constructed of waterproofed, reinforced concrete. Space does not permit a discussion of informal, naturalistic

The Arcade of the Porch Enframes the View of the Garden



Satisfactory Dimensions for Turns

Left: A "Y" Turn from the Garage. *Center:* Dimensions for a Forecourt Drive. *Right:* Turns to Ease the Exit from a Garage Court.

pools. If the pool is partly for growing aquatic plants as well as to give life and movement or reflections, it need be no deeper than 2 feet. This is sufficient for lilies, and if constructed deeper than this, the tubs in which the bulbs are planted will have to be raised above the bottom. If shallower-growing plants are desired, pockets to contain earth may be used in the corners and across the ends as parts of the permanent construction. Where the coping has an overhang, it is well to be sure that its underside lines up straight and level, since any irregularity is conspicuous against the water line. It is best to keep the water level about as far below the bottom of the coping as the width of the overhang in order that the shadow of the latter may be effective. If a blue for the pool is insisted upon, I should use a tile lining, which seems best in the long run, for I have not yet discovered a blue paint or stain that is waterproof and permanent. Green and bluish-green stains are available and quite satisfactory. Black gives the greatest reflecting value, but it detracts from the interest of any colors under the surface.

If ordinary piping is used for the supply line, the pool will probably become discolored from rust very soon. The outlet pipe should be at least 2 inches in diameter, and right-angle bends should be omitted, using instead two 45° angles. This will help to prevent clogging with leaves and other litter and also will facilitate cleaning if the line does clog. Every pool must have an overflow drain to prevent the water from becoming stagnant and to keep the surface clean as well as to prevent overflowing the pool's edges, and to keep a permanent water level. A convenient form for this overflow drain is a pipe with a screen at the top which screws into the clean-out drain. As both drains do not operate at once, this combination is ordinarily perfectly satisfactory.

The Landscape Architect's Charges. Unless the project is so small and so definite that a lump sum payment can be arranged, the landscape architect works upon a percentage basis. To quote from the recommendations of the American Society of Landscape Architects, "this method of charge is much better adapted to the professional supervision of construction work than to the development of plans involving professional advice and drafting room charges, except on large undertakings where the definite and immediate expenditures for construction work can be determined and used as a basis for a satisfactory charge." This schedule (condensed) is recommended by the A.S.L.A. for minimum charges: Preliminary plans only,—2 to 7 per cent on $5000 and over to less than $1,000 worth of work. Complete working drawings and supervision,—10 per cent to 25 per cent on $5000 and over to less than $1,000 worth of work. Many of the larger architectural firms specializing in country house work have their own departments of landscape architecture, each under the direction of a trained landscape architect who is often a member of the firm. So important is the setting of the country house considered that some firms of architects will not accept commissions unless they are given the contracts for the designing both of the houses themselves and of the landscaping. They thus insure an ensemble that is unified. The collaboration between the architect and the landscape architect should begin at the inception of the project, for only in this way is it possible to achieve the best results. The landscape architect can be of material assistance in selecting the site so that the approaches give the most effective views of the house, and also that the gardens and vistas coördinate properly with the important rooms, terraces and porches.

ARCHITECTS' CHECK LIST FOR COUNTRY HOUSES

BY
KENNETH K. STOWELL

PROBABLY one of the most frequent causes of difficulties that arise between architects and clients is due to lack of a clear understanding of the clients' needs and wishes. To eliminate this cause it is wise to make definite notes of conversations with clients and to send copies of the notes to the clients for their verification or amendment;—too often there returns more amendment than verification, because many items, forgotten in conversation, later occur to both architect and client. The use of a Check List greatly facilitates definite decisions and an early and complete understanding. This list is devised so that the topics occur as nearly in chronological order as possible, and it is of course subject to much modification in each individual case of its use. It is advisable to make notes on the Check List as the conversation with the client progresses. The list can be used successfully as the basis of the interview with the client. The discussion can be centered on the various considerations, item by item, and definite decisions may be reached in a short time. This procedure will usually save much of the architect's time and will also prevent that strain on the architect's patience that is inevitable if the interview is allowed to ramble on in hit-or-miss fashion when the architect is tied up with a loquacious client, in spite of other important engagements.

Check List No. 1 covers the important and essential points that should be brought out in the first interview with the client. It is not difficult to explain to the client that one can best arrive at exactly the type and size of country house desired by taking up first certain of the important factors, and later taking up all the details and "charming bits" in their proper order. This is usually as pleasing to the client as it is time-saving to the architect. Much misunderstanding may result by allowing the discussion to run to window-seats, broom closets and ingle-nooks before the essential requirements are ascertained.

Check List No. 1 will give enough information to enable the architect to proceed with rough preliminary sketches. These sketches can be made to indicate merely a *parti* diagramatically and can be the basis for obtaining approximate cubage and cost figures. These estimates should be essential in discussing the country house with the client in a subsequent conference. Much time and drafting expense can be saved if there is a frank discussion of size and costs as indicated by the *parti* sketches based on Check List No. 1, and revisions may be made, as necessary. The client should clearly understand that the *parti* sketches are merely diagrammatic and indicate only the general arrangement of rooms and relative sizes and are subject to radical and immediate revision. From these revised diagrammatic *parti* sketches the real preliminary drawings will be made. At this time the detailed Check List No. 2 can be used to make sure that there is an understanding in regard to the items of exterior and interior materials, and the mechanical, electrical, heating and sanitary equipment. The use of the Check List does not prevent the exercise of the architect's own judgment in regard to materials or equipment, but it will give an opportunity of learning the owner's predilections and prejudices. This procedure will save a great amount of labor and much of the expense that is so often incurred in making several consecutive sets of elaborate preliminary sketches for the client's inspection.

COUNTRY HOUSE CHECK LIST NO. I

A. SITE
- Streets
- Points of Compass
- Survey Required

B. GENERAL TYPE OF HOUSE
(*Style and Materials*)

C. ROOMS

1st Floor
- Living Room
- Dining Room
- Kitchen
- Pantry
- Library
- Morning Room
- Reception Room
- Breakfast Room
- Card Room
- Hall
- Stairs
- Coat Closets
- Lavatories
- Cloak Rooms
- Telephone Room
- Porches, Loggias
- Sun Room
- Billiard Room

Servants' Rooms
- Sitting Room
- Dining Room
- Number of Servants' Bedrooms

2nd Floor
- Master Bedroom
  - Dressing Room
  - Bath
- Master Bedroom
  - Dressing Room
  - Bath
- Master Bedroom
  - Bath
- Bedroom
  - Bath
- Bedroom
  - Bath
- Bedroom
  - Bath
- Stair Hall
- Playroom
- Nursery
- Boudoir
- Sewing Room
- Linen Room

Basement
- Cellar
- Fuel Storage
- Heater Room
- Cold Room
- Storage
- Other Rooms

Garage (Number of Cars)

D. COST (*Amount Client Wishes to Spend*)

E. ARCHITECT'S FEE (*Percentage.....Cost Plus*)

A clear statement of fees to be charged and services to be rendered should be made verbally and also in written or printed form.

CHECK LIST NO. II

EXTERIOR FEATURES

FOUNDATIONS	Material	Waterproofing (*Membrane, Integral*)
MAIN WALLS	Material	Furring
ENTRANCE	Material	
WINDOWS	Double-hung	Casement
	Screens	Weatherstrip
	Storm Sash	Glass (*Grade and Kind*)
	Blinds	
EXTERIOR TRIM	Stone; wood; terra cotta, etc.	

ROOF	Slate	Tile
	Shingle	Composition
	Sheet Metal	Canvas
LEADERS AND GUTTERS	Material	Flashing
PORCH 1	Floors, (*Tile, stone, slate, cement, wood*)	
2	"	
3	"	
CHIMNEYS	Chimney Caps	
PAINT	Whitewash, Stain	

INTERIOR FEATURES

INTERIOR FINISHES (BY ROOMS)

Room Name	*Size*	*Style*	*Walls*	*Floor*	*Ceiling*	*Trim and Finish*	*Notes (special features desired)*
Entrance Hall	.....	.....	.....	.....	.....	.....	.....
Living Room	.....	.....	.....	.....	.....	.....	.....
Dining Room	.....	.....	.....	.....	.....	.....	.....
Library	.....	.....	.....	.....	.....	.....	.....
Etc., Etc.	.....	.....	.....	.....	.....	.....	.....

Under Walls indicate choice of materials and finish, as, Textured Plaster; Wallpaper; Paint; Pine Paneled, etc., etc.

Under Floor indicate material, as oak; parquetry; maple; pine; tile; stone; concrete; linoleum; rubber tile; cork tile; slate; terrazzo; marble; etc.

Under Trim and Finish indicate material of trim and finish, as, paint; enamel; lacquer; stain; varnish; wax, etc.

PARTITIONS
Stud, hollow tile, gypsum, brick, etc.

LATH
Metal (type); wood, wall board, etc.

HEAT INSULATION
Type, material and thickness

SOUND INSULATION
Method and material

HARDWARE
Kinds, styles and finishes
(*Make separate complete list by rooms.*)

HEATING EQUIPMENT

FUEL
Coal, oil, gas, electricity
Delivery and storage provisions

TYPE OF HEATING PLANT
Warm-air Furnace (type)
Steam, one-pipe Steam, two-pipe
Vacuum Steam Hot Water

RADIATORS
Type; style; material; concealed; radiant; radiator covers

AUTOMATIC HEAT CONTROL
Thermostats, etc. Humidifiers

SANITARY EQUIPMENT

WATER SUPPLY
Source, pumps, storage, pressure tanks, etc.

WATER PIPES
Hot—Material, brass, wrought iron, steel.
Cold—Material, brass, wrought iron, steel.

HOT WATER HEATER
Type and Fuel

WASTE AND SOIL PIPES

FIXTURES
Material, type: Lavatory, Tub, Showers, Sitz Bath, Bidet, W. C., Faucets, Mixing Valves. (Accessories.)
(*Make list for each bath.*)

SEWAGE DISPOSAL
Septic Tanks; Sewers

ELECTRICAL EQUIPMENT

SUPPLY
Public Service, Private Plant
Lighting, Power, Heating

OUTLETS *for*
Lighting Fixtures, Floor Lamps, Reading Lamps, Toasters, Percolators, Fans, Sewing Machines, Irons, Washing Machine, Mixers, Buffers, Vacuum Cleaner, Radiant Heaters, Curling Irons, Water Heaters, etc.
Switches (types), Base Plugs (types)

LIGHTING FIXTURES
(*List for each room to be made showing design, type, material and finish*)

BELL SYSTEM for all entrances

ANNUNCIATOR SYSTEM to service quarters; night; day

INTERCOMMUNICATING private telephone system

TELEPHONE (Long distance)

BURGLAR ALARM SYSTEM

FIRE ALARM SYSTEM

SPRINKLER SYSTEM OF FIRE PROTECTION

ELEVATOR
Trunk Lift; Dumbwaiter

RADIO
Plugs and Connections

SERVICE EQUIPMENT

SINKS
Kitchen; Pantry; Faucets

CABINETS
Kitchen; Pantry

RANGE
Coal; Gas; Electric

REFRIGERATORS
Ice; Electric; Gas

INCINERATORS

CLOTHES CHUTE

DISHWASHERS

PLATE WARMERS

LAUNDRY EQUIPMENT

THE SPECIFICATIONS FOR THE COUNTRY HOUSE

BY
CHARLES E. KRAHMER

A HOME is one of man's most personal possessions. It shelters his family and furnishes the means for the enjoyment of their home and social life, and it creates a background for their cultural and intellectual attainments. The country home, owing to its relative isolation, affords great freedom in gratifying personal desires. The construction of a country house is so definitely affected by the character of the client that it is difficult to furnish any but the most general rules for the guidance of the specification writer. The specification for the country house is so often influenced by the client's wishes and the designer's ideas that it is generally compiled directly by the architect specializing in this class of work. Where this is not the case, the notes furnished to the specification writer should be so complete that his function would be limited to the compiling and editing of the specification.

Country homes can be divided into three general classes,— small, medium and large. The medium type is that in which the client's wishes must be most closely followed, for the reason that his desires are generally conservative in relation to his resources. The medium-sized country house, being of reasonable size and not overly ambitious in scope, is the type in which the client generally feels justified in expressing his ideas. The client for the smaller type of country house is generally restricted in his desires by the amount of money available, and is therefore open to reason, so that as a rule comparatively little trouble is encountered with him. The larger type of country house is generally constructed by wealthy and ambitious men. These men, as a rule, cannot afford the time necessary to investigate and pass upon the mass of detail necessary in the planning and construction of the country house of the larger type. Therefore the larger the country house, the less "personal" it becomes. The larger types of country homes are planned with private suites for the client and his immediate family, with private rooms for personal secretaries, maids and valets. The remaining portions of the house are in charge of the housekeeper and her corps of servants. The duties of the housekeeper are to look after the house and the comfort of guests. This type of country house closely approaches the exclusive social hotel or club in operation, and is the least personal of all types.

The physical, moral, artistic, business and cultural characteristics of the client and his family will greatly affect the design and construction of the country house and its later development. Two examples are used here as illustrations. Both houses were handled by the same firm of architects. The first example consisted of the renovating, restoring and enlarging of one of the most beautiful and cherished homes in Connecticut, constructed by the wealthy grandson of the official minister on the "Mayflower," and the home for 150 years of one of the most famous New England families. The later owner was a former cowboy. As an accident, one of the best equipped architectural organizations was selected to carry out the alterations. This organization was instrumental in the selection of an unusually capable man for the development of the 100-acre estate which surrounded the house. The architects had their way in the early stages of the operation, and the house was sympathetically and intelligently restored, preserved and enlarged, retaining all of the simple beauty of the original building. The grounds were very successfully laid out and followed very closely the New England garden of the period, the flowers being of the simplest varieties. After the house and grounds were practically complete, the client assumed control and hired a commercial "decorator" who sold him Louis XVI furniture, Chinese lacquer furniture, oriental rugs, French tapestry, silk damask wall coverings, etc., in contrast to the early New England detail of the house with its spindle stair balustrade, wrought iron hardware, plank floors, brick-faced wood mantels, etc. The garden was filled with marble seats, sun dials, fountains, statuary, etc. Upon the simple brick terrace were placed six gigantic potted palms. The house and grounds are gradually assuming a grandiose effect in startling contrast to the simple New England effect produced by the architects.

The client in the other instances was well known in social and intellectual circles and a powerful factor in the business world. He invited the architect to live in his home for three months so that he could study, at first hand, the social, physical and cultural activities and habits of his family so that they could be properly planned for. The result was a home which adequately provided for the expression and development of the activities and habits of the family and formed an ideal background for their culture and intellectual attainments. This country house was awarded a gold medal for its excellence. I seriously question if the committee awarding the medal realized how perfectly the house fitted and sheltered the client and his family.

The "personal" character of the country house affects the entire construction of the home, and therefore the specification. It should be evident that the existence of considerable confusion and misunderstanding is natural during the planning and construction of the country house. In order to eliminate misunderstandings and confusion, typewritten reports should be made of all conferences with the client, and a copy of each should be furnished the specification writer, who should file it in a folder

kept for that purpose. As soon as the sketches are made for a country house, the specification writer should prepare a "snake," as outlined in an article on specifications entitled "Simplifying the Writing of Specifications," which appeared in the January issue of THE ARCHITECTURAL FORUM. The snake is a memo pad indexed at the edge for the general conditions, general contractors' work, work done by the client, and then with a section for each trade which may be called in to perform work upon the building. Before the preparation of the specifications, all correspondence with the client should be carefully gone over and all important requirements should be then entered upon the snake under the proper trade designation. All reports should be checked by the specification writer and the data extracted and included in the snake under the proper trade heading. Before the preparation of the specifications the snake should be so complete that it will have answered all of the questions necessary to completely compile the specification. At this stage of the operation the snake will form a complete skeleton specification. The snake should be carefully checked by the architect and client before the preparation of the specifications, so that no misunderstanding will occur and no reason will exist for the client's exclaiming, "Oh, I didn't know that you were going to put that in!" The function of the snake is to round up all of the miscellaneous requirements and decisions and to have them before the specification writer at the proper time and in proper sequence, so that no excuse will exist for not including these requirements or decisions in the specifications.

The element of "good will" is most important for obtaining the successful administration of the construction of the country house and is invaluable, owing to the personal character of this class of work. Good will should be carefully cultivated by the specification writer in the early stages of the operation, and considered an essential item in the planning of the country house. Good will is the "lubricant" which prevents friction during the construction of the country house, due in great measure to the client's injecting himself into all phases of the operation and disturbing the routine nature of the work with resulting delays, extras, etc. The general contractor should be selected with extreme care and upon his personal integrity, experience, and financial resources as well as upon his record for carrying out similar work with tact and diplomacy. The general contractor who has a reputation as an "extra hunter" should be avoided under all circumstances, for the reason that there exists no class of work where extra hunting is so profitable as in country house work. The reason for this condition is that the client generally changes his ideas as the house assumes tangible shape and form, allowing him to better visualize what he is getting. Another reason for the profits of the extra hunter is the close contact which exists between the client and the contractor, owing to the personal character of the work. The extra hunter is quick to take advantage of this condition to suggest changes which will lead to his personal gain and operate to the disadvantage of the architect's prestige. A general contractor of the better class will avoid law suits under most any circumstances, as he realizes that law suits with clients are the surest means of destroying his prestige. It is well, therefore, to look into this phase of the subject before approving or recommending a general contractor for this class of work.

"Or equal" should be rarely, if ever, used in the specifications for the country house, for the reason that close competition, which is desirable in public and commercial work, is not so desirable for country house work. The specification writer enjoys an opportunity by means of the "closed" specification, to build up an ideal organization of material, men and subcontractors to perform the work upon the building with tact and diplomacy, thereby eliminating friction to a great extent. The architect can also utilize the good will created by the "closed" specification to build up a skeleton organization which will work to produce exactly what he desires and to allow him to retain control of the building operation by working for and not against his wishes. This opportunity of creating good will between the architect, material men and subcontractors should not be neglected by the specification writer.

A scientific study of building materials in their relation to the country house should be made by the specification writer, so that he will possess first hand knowledge of their qualities, prices and the market conditions. The specification writer should also study the price differences of the various materials as incorporated in a building, so that when relative costs are desired, the specification writer will be in a position to furnish them. This qualification of the specification writer will eliminate a considerable number of alternative estimates. When visiting the site to obtain first hand information in connection with the local conditions, the specification writer should make it a point to interview the local dealers of building materials and obtain from them first hand information in connection with the building materials used and available, with complete data as to the usual stocks carried and the qualities generally used. Much local information can be obtained from the same sources in relation to the local building practices, labor conditions, etc., and also the soil conditions and waterproofing problems which are usual in the locality. There are generally local sand and gravel pits, and sometimes small brickyards. It is wise to visit these sand and gravel pits to see if the material is suitable for use in the proposed building, or if it should be screened and washed, or if it is of no use at all. This information should be included in the specifications, so that the builder knows exactly what to estimate upon. The product of the local brickyards, if any, should be examined to see if it is suitable, and if not the fact should be definitely specified. A careful investigation of local

conditions before compiling the specifications and the inclusion of results in the specifications are the surest means of compiling a "closed" specification which will "stand up" under fire. The time spent in the preliminary investigations referred to amounts to practically nothing and will eliminate, later on, considerable trouble, friction and discussion, as all conditions will be foreseen and planned for.

The most important duty of the specification writer is that of looking after the physical qualities of the building so that it will be capable of resisting the elements in the locality in which it will be constructed. The client takes it for granted that the building will be in good physical condition. The designers are concerned with the planning and purely architectural phases of the problem. The engineers' duties are to look after the structural safety and mechanical efficiency of the building. Securing weather-resisting qualities and making the proper selection of materials and their quality are the duties of the specification writer.

The first problem to solve is the waterproofing of the basement. Test holes should be dug to the level of the deepest proposed excavation, and the soil conditions and water level, if any, should be carefully noted. When a waterproofing problem occurs, there are two methods of attacking it; one is to remove the water, and the other is to waterproof the basement, or, in the vernacular of the trade, "build a boat." The best method of removing the water is to install an agricultural tile drain around the building at the footing level and backfilling to grade with cinders or similar coarse material, so that the water can percolate through the fill to the tile drain and then be carried away. When springs are encountered in the basement, or a severe condition occurs, it is better to excavate 6 inches below the concrete basement bottom and fill in the space with field stone, brickbats, cinders, and finally a thin layer of clay upon which the concrete basement bottom should be cast. A line of drain should be installed in trenches through the center of the basement, and branches installed in trenches 10 feet on centers. These tile drains should discharge on grade, where possible, or into a brook or similar stream. Where the discharge is into a storm sewer, a manhole should be installed to catch the sediment. The three methods of waterproofing are: (1) integral system, (2) membrane system, and (3) pulverized iron system. The integral system consists of adding a chemical compound to the ingredients of the concrete, mixing and depositing the concrete as directed by the manufacturer of the compound. The integral system of waterproofing has been referred to as "85 per cent labor and 15 per cent compound." The general contractor, if he is worthy of the name, realizes that "water content" and "density of mix" are the important requirements for waterproofed concrete. The general contractor should guarantee the waterproofing in writing. The pulverized iron method of waterproofing consists of the application of numerous coats of pulverized iron mixed with a corroding chemical designed to corrode the pulverized iron immediately upon application, expanding and gripping the concrete so that a plating of iron will eventually cover the inside of the foundation walls and bottom. The corrosion is then arrested by means of a cement wash or trowel coat of cement mortar. This work can be installed only by experts and is generally guaranteed in writing directly by them. The membrane system consists of using asphalts or pitches of various grades for the waterproofing agent, and rag felts, asbestos felts, burlap and cotton cloth for reinforcing agents. The method consists of building up a series of layers or piles of waterproofing agent and reinforcing agent applied alternately. The writer prefers the best grade of asphalt for the waterproofing agent and a saturated cotton cloth for the reinforcing agent. Membrane waterproofing should be applied by waterproofing contractors, not by roofers.

The next important problem is the construction of the weather-exposed masonry walls. Most of the failures in the construction of country houses are due to leaking and damp exterior walls. No possible method is a "cure all" for all conditions, since the exposure of the walls and the location of the building have a definite effect on the construction and weather-resisting qualities of the walls. At Newport, a stone country house with walls 2 feet thick was so located in reference to the prevailing winds, sun and dampness that the moisture penetrated the walls and completely rotted out the 2 by 4-inch furring strips, making necessary the entire reconstruction of the finish on these walls. A safe rule to follow is always to furr weather-exposed masonry walls. Should the location of the house be such that fogs and long periods of dampness are liable to occur, such as at Newport and sections of Long Island, the sensible method is to apply an asphalt compound to the interior of the wall and then to furr the wall with split furring tile. Where unusually good construction is desired, it is good practice to waterproof the mortar used in laying the brick or stone, and then parge the inside of the wall with 1:2 Portland cement mortar, upon which the waterproof asphalt paint and tile should be installed. All windows should be calked and heads covered with copper. The selection of the face brick for the exterior walls is important, as it is becoming common knowledge that a brick with a medium rate of absorption will help create a dry wall, due to the greater bond between the brick and the mortar and primarily because the moisture will "mushroom" across the face of the wall, create a "blotter effect," allowing the heat and sun to extract the moisture through the entire face of the wall and not through the joints, which would occur if an impervious brick were used.

When the northern styles of architecture are used as precedents, and are followed closely, it is customary to use substantially the same materials as are used in the original buildings. When this is done, little trouble will be experienced, since the materials

used in the construction of the northern styles were selected to withstand climatic conditions. The proof of this is how well they have endured through the ages. When the southern styles of architecture are used as precedents for homes constructed in our northern climates, the specification writer's troubles begin. The result is similar to that which would follow transplanting a tropical tree in Bronx Park, New York. The materials used in the southern styles are, as a rule, colored stucco, colored and glazed architectural terra cotta, cast concrete stone, terra cotta roofing tile, and a multitude of imitations of these materials, and the great majority are inferior to the original materials they are designed to replace. In the southern climates we do not encounter the destructive action of moisture, penetrating a building material and then freezing and thawing. This action disintegrates most materials, but has a particularly destructive effect on architectural terra cotta, cast stone, stucco roofing tile, etc. In southern climates the heat of day will evaporate the moisture before it has a chance to do any harm. The temperature changes also are relatively small, so that the effect of expansion and contraction is not severe.

There is little in the interior finishing of the country house which the specification writer need feel as a special responsibility. The selection of materials in almost all cases is that of a personal nature. The exact class of material and workmanship desired should be carefully specified in detail, so that the bidder will know exactly what to estimate upon. The better sort of country house building is divided into two classes. The one class consists of the construction of the shell of the building, including the finishing of the service portions of the structure. The finish of the main rooms is generally handled as a separate operation and not by the general contractor. The finishing of the main rooms is let as separate contracts directly to high class cabinet and decorative contractors specializing in this class of work. The specifications for the finishing of the main rooms should be accurately and carefully compiled so that the exact class of work desired will be covered in detail. The exact flitches of the veneers should be selected from a hardwood dealer, and then the period hardware should be selected from a dealer specializing in this class of work. After these details are taken care of, the specifications should be compiled. In the better class of work it is good practice to require that all woodwork in the rooms, including the doors, be built up complete in the cabinet shop, and be veneered from the flitches of wood selected from the hardwood broker's stocks. This should include panels, rails and stiles, except the mouldings which may be of solid stock. The cabinet work is completely finished in the shop and delivered and set up complete, like fine furniture. Schedules of finishes were designed to simplify the preparation of plans and specifications and also to tell exactly what is required for finishing a particular room or space. The schedules of finishes list up generally the finished floor, base, wainscot, plaster, picture moulding, chair rail, cornice, ceiling and mantels occuring in each portion of the building, and are either included as part of the drawings or included in the specifications. The writer prefers to include the schedules in the specifications, where they are indexed and numbered, showing where the different finishes are specified in detail.

Questions will arise as to the relative costs of different materials for a given place. In the absence of definite cost data, the architect will generally suggest that alternative estimates be requested from the contractor. This matter of requesting alternative estimates is being greatly abused and is causing contractors heavy estimating costs. The practice should be discouraged as much as possible, as the better class of contractors are refusing to estimate where an unusual number of alternative bids are requested. It is considered better form to request the alternative estimates as additions to the bid rather than as deductions, the theory being that the base bid includes the minimum that will be accepted, so that the client can add desirable features as his funds will permit. Another reason is the practice of the estimator in quoting the price used in his "makeup" sheet for deductions without giving the client the advantage of the overhead and profit charges included in the final tabulation. The alternative estimates should be segregated so as to appear in a separate section directly after general contractor's work and not scattered throughout the specification, causing a "hide and seek" game to find them.

The specification for the country house can be summed up as an instrument controlled in a large measure by the personal desires of the client. The specification writer's function in this class of work should include:

1. Preserving order, so that no mistakes will occur.
2. Assuming responsibility for the physical qualities of the building.
3. Preparing a complete document, so that a standard agreement can be executed.

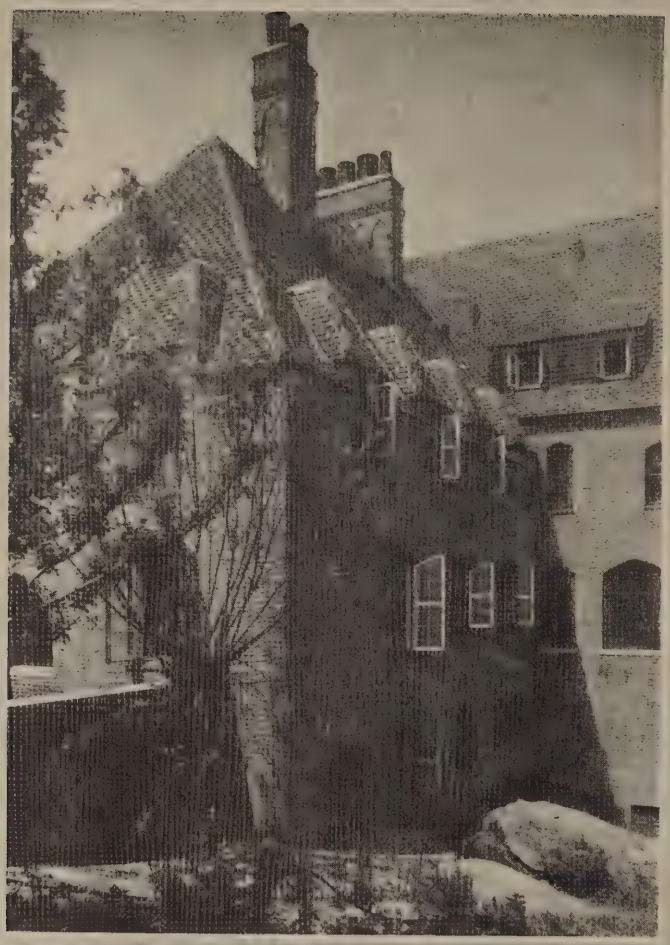
The duties herein summarized are very difficult to assume in connection with the specification for the average country house. This is due mainly to the personal character of the work. The specification writer must be tactful and diplomatic in his relations with the client and should not try to impose his ideas in questions of a purely negative character. Those questions which relate to the physical quality of the building and the proper and fair administration of the work, should be decided by the specification writer. Should questions of this character be decided against the better judgment of the specification writer, he should make it plain that he will assume no responsibility for the results of such decisions. The successful solution of the practical problems arising in connection with the planning and construction of a country house, with all its complications, is one of the quickest and surest methods of building up the prestige of the architect.

THE ARCHITECTURAL FORUM

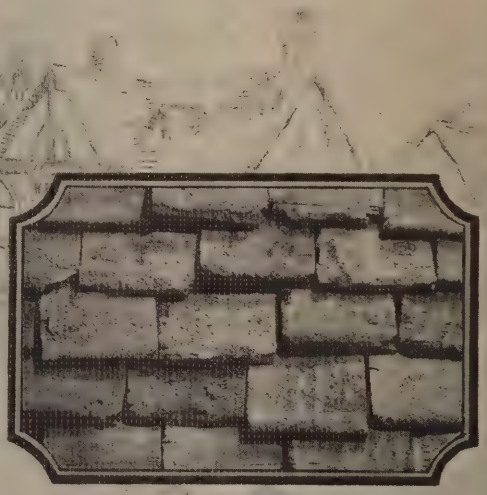
IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

OCTOBER
1928



The fine country residence of Harry J. Guggenheim, at Pt. Washington, Long Island. Fredrick Sterner, Architect.



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BOOK DEPARTMENT

A PARALLEL OF THE ORDERS, GREEK AND ROMAN

A Review by
CLIFFORD WAYNE SPENCER

FOR thousands of years men have been living among buildings whose decorative treatment and general proportions are based on the Classical orders of Greek and Roman architecure, so they have come to be regarded as the standard of beauty and symmetry in all important structures. The science of building has developed from earliest times, each new development being founded on what has gone before it. The present modernistic style represents the most radical departure from the traditional method of building since the introduction of Gothic architecture, but even such an innovation, if it is to develop sanely, must be based on a thorough knowledge of the history and conventions of academic architecture. Moreover, it is not likely that buildings based directly on the Classical orders will ever cease to be built, and it is very probable that an intelligent understanding of architecture will always continue to be based on a thorough knowledge of the Greek and Roman orders. Our records of these orders consist of more or less ruined examples of ancient buildings and of the drawings of great masters of architecture and archæology, such as Palladio, Scamozzi, Vignola, Lescot, De Lorme and Bullant. These men have adapted the orders to their own uses and have standardized them so as to make them readily available for students and architects.

A most valuable and usable collection of drawings after these masters and many taken direct from the ruins themselves has been compiled by Charles Normand and is presented in the "comparative" or "parallel" manner. John Tiranti & Company, of London, have issued an English edition of this work in a very compact and usable form and at a surprisingly low price. The subject is covered most completely and in a manner to make it most practical for use by the student or the busy architect. The various orders are each illustrated by examples according to the different classical designers, shown in juxtaposition, so that it is very easy for the user to compare them and adopt the form best suited to his particular problem. In addition to data on the columns and entablatures themselves, there is considerable material on intercolumniation, pedestals, pediments, doorways and much other valuable information. The drawings are all clearly scaled and dimensioned, the unit module being the same in all cases, and the module adopted for the

THE DAVANZATI PALACE, FLORENCE

A Restored Palace of the XIV Century, Measured and Drawn, Together with Short Descriptive Text, by
LOUIS CONRAD ROSENBERG

THIS work is issued to provide for architects, decorators and students a volume of moderate cost on one of the old Florentine palaces, a building which abounds in suggestions readily adapted to present-day work. The Davanzati Palace is one of the most notable of the early Italian palaces and belongs to a period when Italian architecture excelled in simplicity, charm, and all the qualities which lead to its use today.

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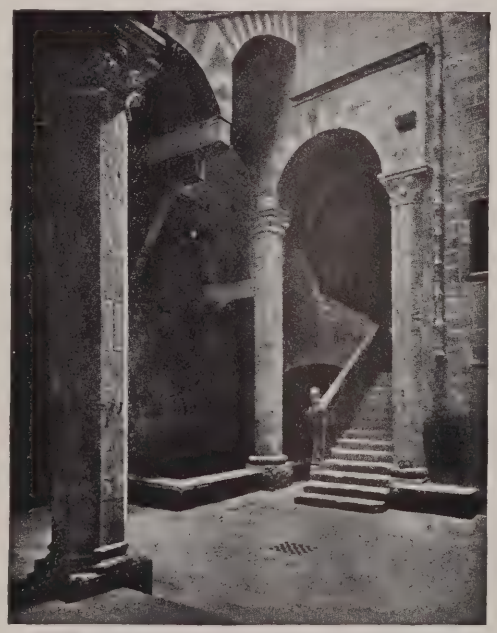

MEASURED drawings of bases, columns, capitals, mouldings and corbels; mantels, ceilings, door and window trim, paneled doors and inner blinds or shutters; floors laid in tile or specially modeled Roman brick; wrought iron hinges, bolts, knockers, escutcheons, holders for flag poles or torches, and hooks for wall hangings. Measured drawings for polychrome ornament on plaster walls or wooden coffered ceilings or tabernacle doors, with descriptions of colors used.

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F. E. Howard and F. H. Crossley

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370 pp. 7x10 ins.
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orders of Vignola also being given. The quality of the binding, paper and printing is exceptionally good, and the book itself is a valuable source of ready reference on this important subject, a part of all architectural study.

A PARALLEL OF THE ORDERS OF ARCHITECTURE, GREEK AND ROMAN. By Charles Normand. Explanatory Foreword and 63 Plates; 9¾ x 12½ ins. Price, bound in cloth, $3; in portfolio, $2.50. John Tiranti & Co., London, W.

PICTURES AND PAINTING. By Margaret H. Bulley. 240 pp., 5 x 7½ ins. Price $3. E. P. Dutton & Company, New York.

HOW to identify true art from its counterfeit is the theme of the author's discourse in this book. What makes a painting good art, what bad, what indifferent? How may the amateur critic recognize a great picture without depending for his guidance on the artist's reputation or, still worse, on the "Baedeker" star?

The author opens her discussion by conducting nine imaginary and typical visitors through a famous gallery. Each has come to study art and enjoy its pleasures. Each looks for a different quality in a picture and admires it or rejects it, depending on whether or not he finds that particular quality. There is the dilettante, who studies art to keep in fashion and to be able to talk about it. There is the art historian, the Sherlock Holmes of the gallery, who thinks he knows art if he can identify the painter, his epoch, nationality and school. There is the wealthy collector, whose end and aim are expenditure of cash. There is the man who looks only for beauty in the faces or scenes depicted. The characters include all the varying types, and with catalogs in hand, they surge indifferently or confidently through an art museum, intent upon "getting art." But to make a long story short, the first eight are all wrong in their methods of approach and their aims. They do not know what to look for. It is only the ninth who holds the key to the door that reveals art. He is indifferent to the painter's reputation; he needs no catalog to guide him to the masterpiece. He is engrossed by something the others do not even seek. He finds it in certain pictures, and those that possess it please him. This important something is *design*.

What is design? In its simplest form it is composition, the author explains. More accurately, it is order and balance, a "satisfying arrangement of lines, masses, spaces and colors" so unified and balanced as to give equilibrium and harmony to the whole. And underlying the whole there must be some universal significance of what the artist wishes to express. Giotto had design in his paintings, although today they are often called crude. Masaccio had it; so did Raphael, Michelangelo, Rembrandt, and Velasquez. Every truly "great master" had design, and those of the later era show no advance over those of the mediæval centuries, save in the development of technical skill, important as technical skill may be.

"One should judge the paintings of the stone age," says Miss Bulley, "by the same standards as those of today,—not by formal structure only, since this is psychologically impossible, but by the quality, richness and precision of the experience as conceived, embodied and communicated in terms of design." When one uses design as the "polar star," the sea of art is no longer uncharted, she declares. One may wander without confusion through a vast exposition where the paintings of all schools and all times are hung without labels or sig-

natures, and with unerring eye pick out the great planets from the "will-o'-the-wisps and wandering fires." But to know design when one meets it,—that is the acid test which the unschooled amateur will find it difficult to meet. For design implies many things which compose, in total, all the fine points of art. It implies the proper relation between details and the whole; the former must not overshadow the latter. It implies solidity and depth. A flat, two-dimensional surface may be beautiful as a photograph is beautiful, but a suggestion of the third dimension makes for the greater art. For this reason certain portraits by Rembrandt, Franz Hals and Velasquez are superior in design to those of Sargent. Sargent's women are more beautiful of feature, but they tend to be "flattened forms against a flatter background," while those of the earlier three artists appear to have weight,—they stand out as if "carved in stone."

Accurate imitation of nature does not necessarily imply great art, for "the beauty of art and the beauty of nature represent, broadly speaking, two different kinds of beauty." The picture must have an emotional value in itself in addition to its value as description or representation. It is the artist's experience that must be communicated by his works. The virtue of art, therefore, does not lie in the accuracy with which the painter imitates the appearance of things. Design implies strength and sincerity as distinguished from mere prettiness and sentimentality. Beauty alone does not mean design, although as Miss Bulley observes, "it takes genius to turn a flayed ox into a thing of beauty."

It is because so few of us, she explains, can recognize design, that many great works of art lie outside our comprehension. She quotes a verse which, perhaps, expresses the confusion of many who "do" the galleries:

"Although the world is fair to see,
The artist cannot let it be.
He fiddles with the works of God
And makes them look uncommon odd."

Using *design* as the polar star of judgment, the latter half of the book deals with painting in general. It is a discussion of the aims and purposes of the great artists, rather than a mere history of their works. The author includes a clarifying exposition of the difference between the various schools of painting, from ancient days, when men painted religious pictures for their cathedrals and when painters were tradesmen like blacksmiths and tinkers, to modern times when the artist is likely to take himself and his work too self-consciously. Everyone, she says, should form his own judgment on art, rather than accept the ready-made opinions of others. "It is better honestly to admire bad or counterfeit art than to simulate admiration for some famous work. Admiration for the Baedeker star is fatal." And, she adds encouragingly, that one may learn how to incline one's judgment toward the best. Her chapters on the post-impressionists, the cubists and modern artists are particularly helpful, since they show the contribution of each movement to art.

The book is one of the "Simple Guide" series and is, therefore, of value and interest to the amateur lover of art as well as to the student or true artist himself. It is simply and entertainingly written, and included with the text are 31 plates of famous paintings illustrating the points she makes clear in her valuable subject matter.

An Authoritative Work on

"THE GREEK REVIVAL"

By HOWARD MAJOR

THE search for effective types of architecture for domestic use led logically to the re-discovery of the style known as the "Greek Revival." In the hands of a few particularly skillful architects it is being used with marked success, their use being based largely upon study of such examples as have survived the period, just prior to the Civil War, when use of the type was widespread throughout the United States. It is an entirely American style, founded not upon a following of current English architecture but upon a study by Americans of classic types adapted to domestic uses.

Mr. Major's excellent work is the result of a careful study of the style as it was interpreted in the North and East, and particularly in the South. The illustrations of exteriors and interiors are full of suggestions for anyone seeking a variety of architecture bold, simple and effective, which supplies a fitting background for life in America. The book is richly illustrated, and shows existing work, large as well as small, in both city and country.

236 Pages; 7⅛ x 10¾ inches. Price $15

ROGERS & MANSON COMPANY
383 MADISON AVENUE, NEW YORK

ART STUDIES, MEDIÆVAL, RENAISSANCE AND MODERN. Edited by Members of the Departments of the Fine Arts at Harvard and Princeton Universities. 156 pp., 8¼ x 11¾ ins. Price $7.50. Harvard University Press, Cambridge.

THE editorial statement of the first issue of "Art Studies," in 1923, gives a clear exposition of the purpose of the publication which it is well to bear in mind in reading the later issues. To quote only a few sentences: "The purpose of this annual is to offer better facilities than have heretofore existed in America for the publication of studies in the mediæval, Renaissance and modern fields. We welcome scholarship which adds to ideas as well as that which adds mostly to facts. We also shall prefer articles of some extent and substance to notes and reports on single monuments." This, together with the title "Art Studies, An Extra Number of the American Journal of Archæology," ought to give the prospective reader an idea of its contents. If he is a practicing architect, who seeks illustrative material for help in designing churches and public buildings, there is little use in his even turning the cover. If he is an architect of purely domestic work, looking for contemporary examples of residences, he too will seek in vain. This is no publication for professionals or laymen, but one primarily and superlatively for the scholar, the archæologist and the graduate research worker in art.

Here the connoisseur in iconography will find a truly fascinating discourse on the representation of round and square tables in the pictures of the Last Supper and possible connections with the Round Table of King Arthur. ("The Table of the Last Supper in Religious and Secular Iconography," by Laura Hubbard Loomis.) The student of architectural history will here find various articles on very special, often out of the way, subjects, which are contributory to one phase or another of art history. The article by Edgar W. Anthony on the Florentine baptistry is a skillful and readable account of that ancient and much discussed monument. In turning the erudite pages the glimpses of St. George and his excessively spikey dragon by the mediæval sculptor of Lubeck, Bernb Notke, cannot fail to delight. The title of the short article "A Plastic Cyclone" (by Kuno Francke) is well chosen. The articles are not confined to the English language, and for those who read Italian and are interested in Eastern Art, *"Il Problema dell' Arte Sasanide,"* by Ugo Monneret de Villard, will prove informative on the complexity of sources which contributed to the art of Iran. The field is evidently one to be explored. There are two articles in French in this issue, one by Monsieur Charles Diehl, an authority on Byzantine art, entitled *"Monuments Byzantins Inedits du Onzieme Siecle";* and the other by Monsieur Charles Oursel, a member of the *Faculte des Lettres* at Dijon. The latter is an article of ample proportions, profusely illustrated, dealing with that magnificent and unique church in Burgundy, the abbey of Vezelay. The struggle for its possession between the Cistercians and the monks of Cluny becomes a real issue, as one reads, and the study of the resultant effect on the architecture of this abbey makes this article particularly interesting. One of the other titles in this issue will suffice to give an idea of the range of subject matter: *"Apostolados,"* by Dorothea C. Shipley, a graduate of Bryn Mawr and a follower in the footsteps of Miss Georgiana G. King.

"The Spanish House for America"

By Rexford Newcomb, University of Illinois

THE undoubted charm of the simpler type of Spanish architecture is due largely to its close relation to the soil. Set close to the ground, and built as a rule of brick, stucco, adobe, or some other material directly of the soil, Spanish domestic buildings have the appearance of belonging in a particular sense to the places where they stand. The simplicity which characterizes their structure is equaled by the simplicity of their design, always given in Spain a direct, naïve quality, which the early Spanish settlers in America secured when they began colonizing and building in Florida, California, and the other regions in America where they were the pioneers. The simple grace and charm of their buildings are being equaled today, and some of the most strikingly successful of recent domestic work owes its excellence to this following.

IN this volume an architect and professor of architecture deals with the most successful adaptation of Spanish domestic architecture in the sunny parts of America where its use is most appropriate. Disregarding the extremely ornate work, where the simplicity of the type is ruined by over-elaboration, he presents the American following of the early Spanish style in its most charming aspect. The work deals with the design of the house; its *patio* and general plan; its construction, decoration and furnishing; and one of the most helpful parts of the volume discusses the various forms of craftsmanship which aid in giving the strong character upon which such buildings largely depend. The volume is also helpful because of its including illustrations of the exteriors and interiors of houses built by the architects who are leaders among those successful in use of the Spanish style.

Profusely Illustrated; 164 Pages; 6¾ x 10 inches; Price $3.50

ROGERS & MANSON COMPANY, 383 MADISON AVENUE, NEW YORK

THE EDITOR'S FORUM

COLUMBUS MEMORIAL COMPETITION

ON the island of Santo Domingo, discovered by Christopher Columbus on his first voyage to the western hemisphere, a lighthouse and a Pan-American flying field equipped for trans-continental service, memorials to him, are to be designed by an architect chosen in a world-wide competition. Well located for air travel between New York and Buenos Aires, the light of the memorial will guide not only sailors but, fittingly, aviators too, whose intrepid spirit perpetuates that of the great navigator. Wisely, a monument that will "contribute to knowledge and to thought" is sought. A flying field provides great opportunity. With rare exceptions, such as the field designed for Pau, France, by Maurice Chaucon, the present flying fields, which undoubtedly will soon be national gateways, have unfortunately been developed without architectural treatment, simply as utilitarian needs increased, and fully as inferior in design and facilities as are many railway terminals.

In designing a flying field, the architect, like Columbus, treads new ground. His problem has no precedent; there is no tradition to which he can turn for help. He must, then, seek out the requirements, and from them, if he is able, construct a plan meeting all contingencies and a group of buildings imposing, admirably landscaped in every detail, and as a whole more truly modern than any that the world has seen. There must be provisions for housing and landing both airplanes and dirigibles; transporting passengers and freight to and from the field; refueling and complete repair shops; a radio station and floodlight signals; ticket booths and customs offices; quarters for the pilots and the field staff; restaurants and, perhaps, hotel accommodations; facilities for exchanging foreign money and for supplying passengers with personal necessities left, by mistake, at home. Even if machines that can take the air vertically are perfected, it is unlikely that flying fields will ever be located, as railway stations are, in the midst of unrelated structures, for the hazards of taking the air and landing would thereby be foolishly increased. The flying field is a problem of a self-contained, all-inclusive unit. Fortunately requiring open land, it provides gratis, unlike most modern architectural problems, a splendid landscape for its buildings, to give the entire composition a proper setting and to secure adequate dignity.

The program gives the competitor the utmost freedom. The site is near the city of Santo Domingo itself; the traffic routes between the city, the seaport, and the airport are left to his discretion. The only mandatory demands are: (1.) that the memorial lighthouse,—which will be the first unit to be completed,—shall stand on a mound, or terrace, or terraces, about 40 feet high, in order that its base may be visible over the treetops from every direction; (2.) that the structure, whatever form it may take, shall contain a chapel large enough to receive the Columbus monument now in the cathedral; (3.) that a museum be provided, either as part of the chapel or elsewhere, to contain such appropriate relics as may become available over a long term of years; (4.) that it shall support at least one great lantern; (5.) that the design, as seen from a distance, shall have a significance that will grip the imagination; (6.) that all the technical resources of modern illumination shall be considered for the production of an effect quite as interesting by night as by day. The competitor, besides selecting a site for the lighthouse in the 2,500 acres of restricted property, must indicate a comprehensive development of the remainder of the tract, providing for a complete airport measuring at least 2,000 by 3,000 feet with a runway about a mile long, an official center with a new residence for the President of the Republic, and one or more additional residential structures.

In the future, island airports will be more vital links in trans-continental service than the coaling stations of today. With the present rapid development of aviation, air transport between America and Europe, and between America and Asia seems certain, but a linking of the Pan-American countries by this means should be realized even sooner. Santo Domingo lies almost in the direct route between Montreal, New York, and Buenos Aires, and in direct line between the important centers of northeastern United States and Canada and those of northern South America. Col. Lindbergh has proved the feasibility of flying between them. That Santo Domingo, contemplating building an important airport, turns to the architects of the world for its design, shows fine perception of the need for coherent and beautiful schemes for what will be salient points in national and international life. It challenges architectural ingenuity to produce something in line and mass inherently as graceful and as simply impressive as the airplane itself.

The peculiar tropical conditions of terrain, atmosphere, and vegetation will have to be considered. There must be strength sufficient to withstand possible hurricanes and earthquakes. The function of the project demands that the architecture be modern, and its location and memorial purpose require that it be American. Santo Domingo has issued a formidable challenge. All communications relative to information should be addressed to Albert Kelsey, Technical Adviser, Permanent Committee on Columbus Lighthouse, Pan-American Building, Washington. No inquiries received after December 1, 1928 will be answered. The competition closes April 1, 1929.

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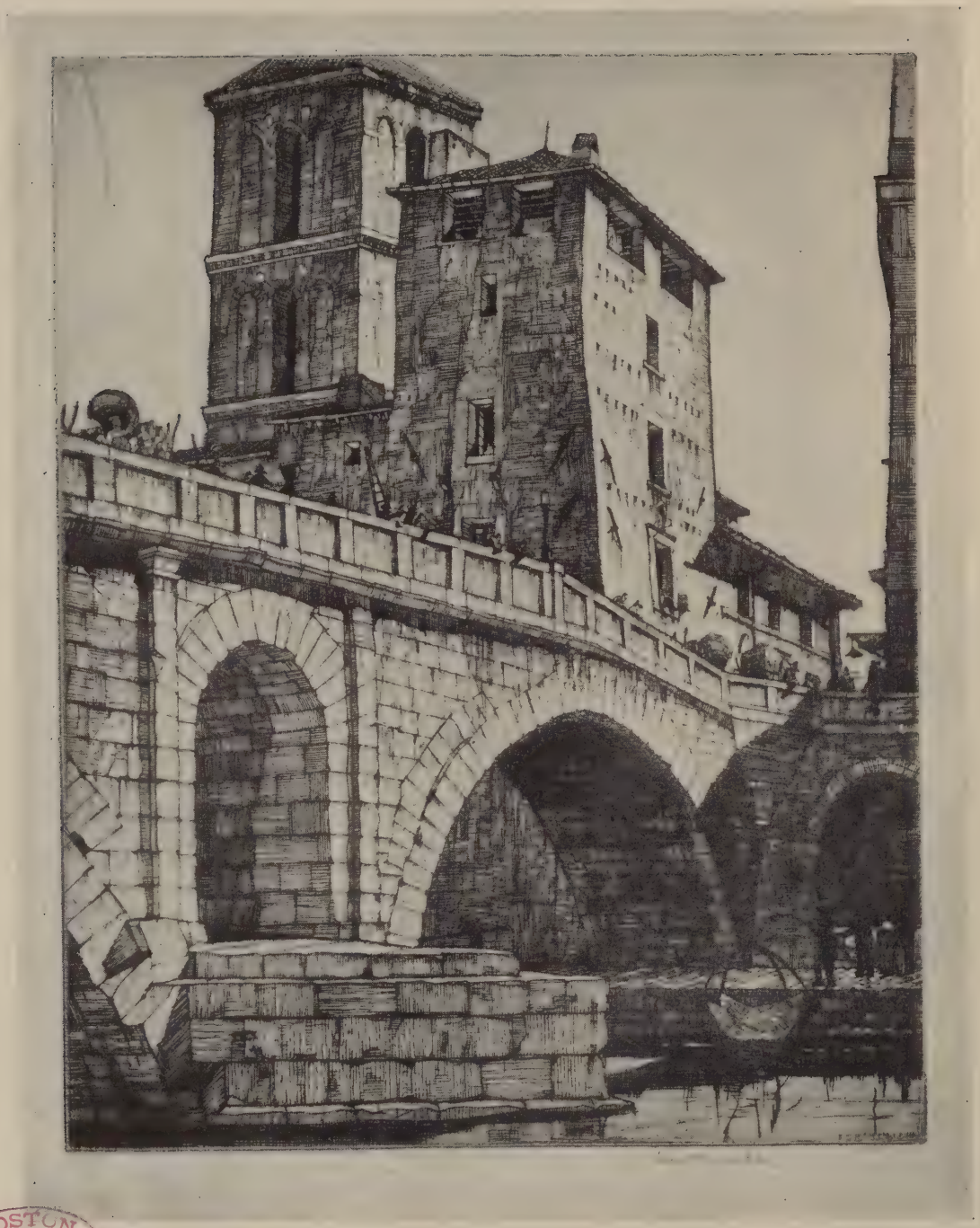

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PONTE FABRICIO, ROME

From an Etching by Louis C. Rosenberg

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER FOUR

OCTOBER 1928

THE NEW BUILDING OF THE GERMANIC MUSEUM, HARVARD UNIVERSITY

BY
KUNO FRANCKE

IN speaking of the Germanic Museum building as "new," it should be said that it was completed during the World War and opened to the public in 1921. At that time, however, the state of public feeling aroused by the war was still such that this essentially German building failed to attract the attention which it otherwise, by reason of its originality and artistic merit, would have received.

Its designer is Professor G. Bestelmeyer, one of the foremost living German architects, now President of the Munich Academy of Fine Arts. His general drawings arrived in Cambridge in various installments before and after the outbreak of the war. His personal supervision of the construction being out of the question, the firm of Warren & Smith, of Boston, appointed by the Harvard Corporation as associate architects, undertook this task, the senior partner, Professor H. Langford Warren, then Dean of the Harvard School of Architecture, devoting himself chiefly to the supervision and, wherever necessary, the modification of the architectural features, while F. Patterson Smith, the junior partner, attended to all matters connected with the engineering part of the work. Both men rendered invaluable service in this cause. In fact, it is they who translated the ideas of the German architect into American terms and thus produced a structure in which different conceptions of artistic problems have been blended with remarkable success.

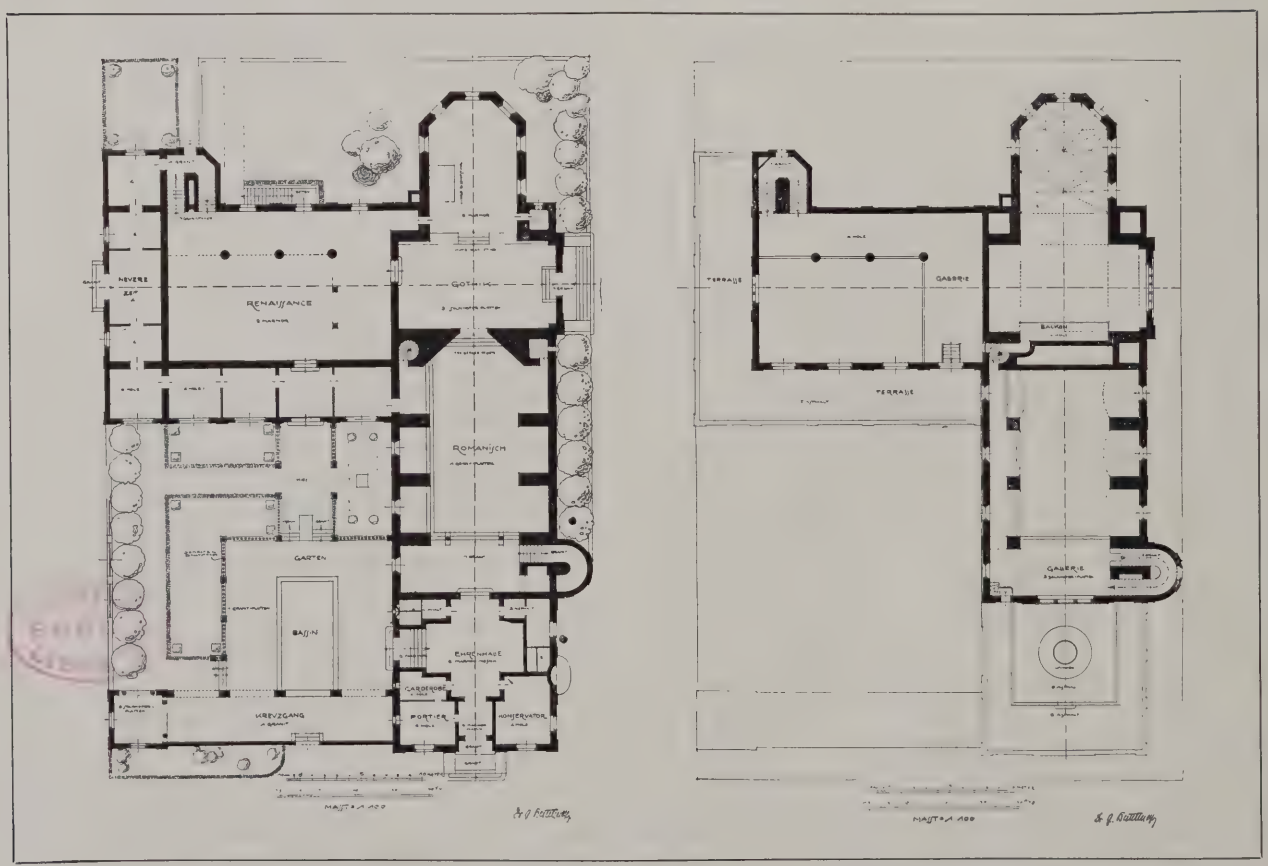
To Professor Warren belongs the credit of choosing the decorative finish of most of the architectural detail. He selected the Indiana limestone for the structural supports of outer and inner walls, the patterns of the tile floors in the transept and chapel, and the plain quarry tiles in the Renaissance wing. He devised with the greatest care the whole color scheme of the interior. He supervised all the fine decorative ironwork, made after Professor Bestelmeyer's designs by Frank Koralewsky, of Boston. Professor Warren engaged Roger Noble Burnham as sculptor of the centaur figure on the stone dormer of the west side of the Renaissance wing and the Minerva head over the Divinity Avenue entrance. He directed the remarkable modeling by Mr. Kirchmayer of the heads of Wotan, Siegfried and Brunhild on the south facade of the Renaissance wing, and of the Apollo head over the front entrance, and brought all the other carved decorations over doors, windows, and balustrades into harmony. He made necessary changes in the levels of various floors and in the shape of the arches of the cloister. That death should have removed him from the midst of his devoted work gives to the connection of his name with the Germanic Museum a tender association.

Mr. Smith selected the red tiles of the roof, the Vermont porphyry for the columns of the Renaissance Hall, the slabs of split slate for the floor of the Romanesque Hall, and the solid and unsmoothed oak timbers framed in antique manner for the cloister of the court, and he worked out the whole scheme of designing, placing and finishing the reinforced concrete frame of the building,—a task attended with considerable difficulty because of the great structural variety of Professor Bestelmeyer's design. Indeed, it may without any exaggeration be said that many features of this construction had never been attempted in this country, and therefore they constitute a real contribution to American engineering. Particular mention should be made of the use of the precast segments of the dome over the Baroque vestibule as forms for the concrete ribs, and of the tooling of the surfaces of the concrete arches and vaults in both the Romanesque Hall and the Gothic Chapel, thereby exposing the coarse aggregate of the concrete. Credit for one part of the building belongs entirely to Mr. Smith. Professor Bestelmeyer's plans had left the upper story unfinished. Here Mr. Smith, having after Professor Warren's death established a firm of his own, constructed over the Renaissance Hall a very attractive lecture room of monastic appearance, and connected it by stairways with both the street level and the gallery of the second story. The completed building, as it now stands, is a fine example of the modern Munich school of architecture of which Bestelmeyer is the most illustrious living representative. He began some 25 years ago as a pupil of Gabriel and Emanuel Seidl, the architects of the great *Bayrisches National Museum,* with whom he shares a love of the picturesqueness of Bavarian popular art. His first

work, of unquestionable genius, was the enlargement to more than four times its original size of the main building of Munich University. Leaving untouched the old severely monumental front on the Ludwigstrasse, he erected on the parallel Amalienstrasse a front of equal length, but of much greater richness of detail, and connected the two facades by a system of halls and galleries surrounding a magnificent vaulted court of bold and striking originality.

It was this splendid achievement by a young man, showing both respect for traditional forms and a marked power of developing them into something new, which made it clear to me that here there was a most unusual opportunity of acquiring a type of build-

Germanic Museum, Harvard University
Professor G. Bestelmeyer, Architect
Warren & Smith, Associated Architects

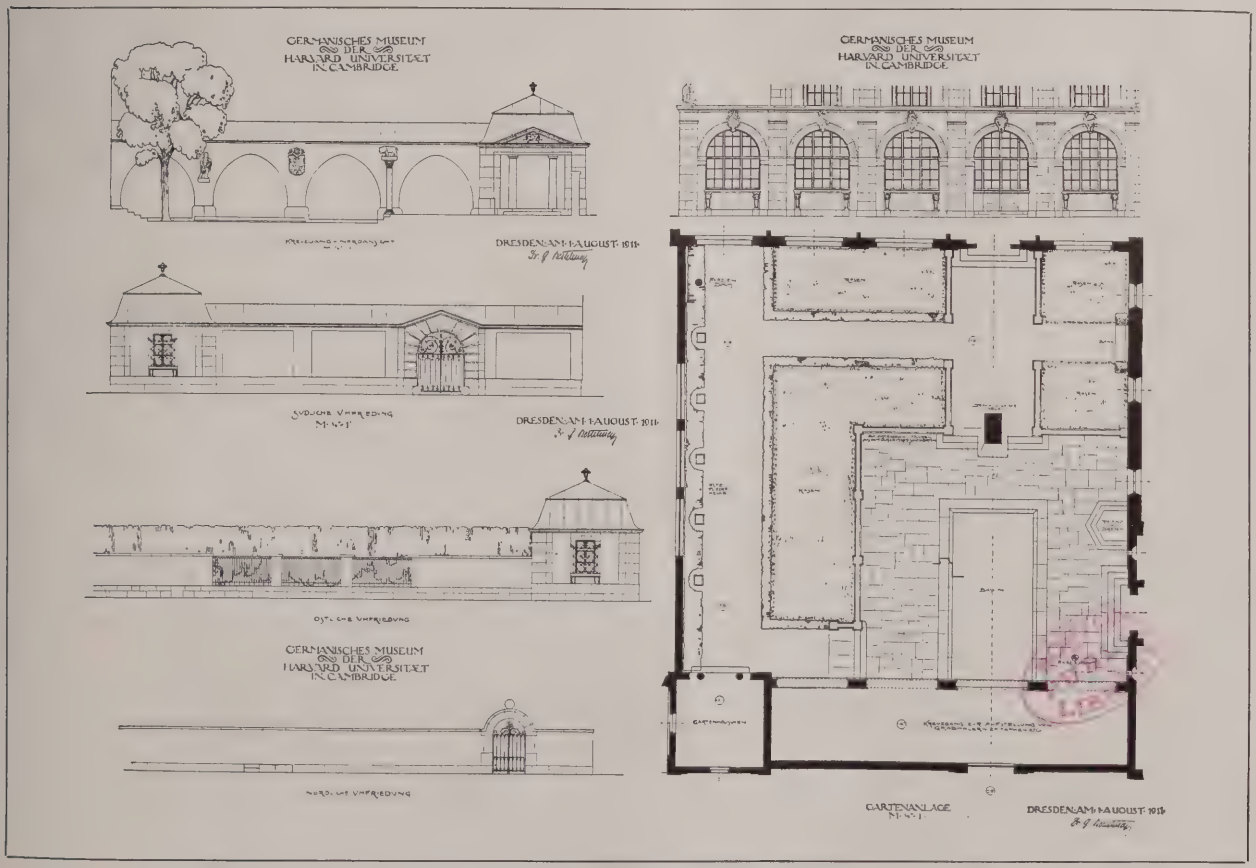


Ground Plan Clerestory Plan

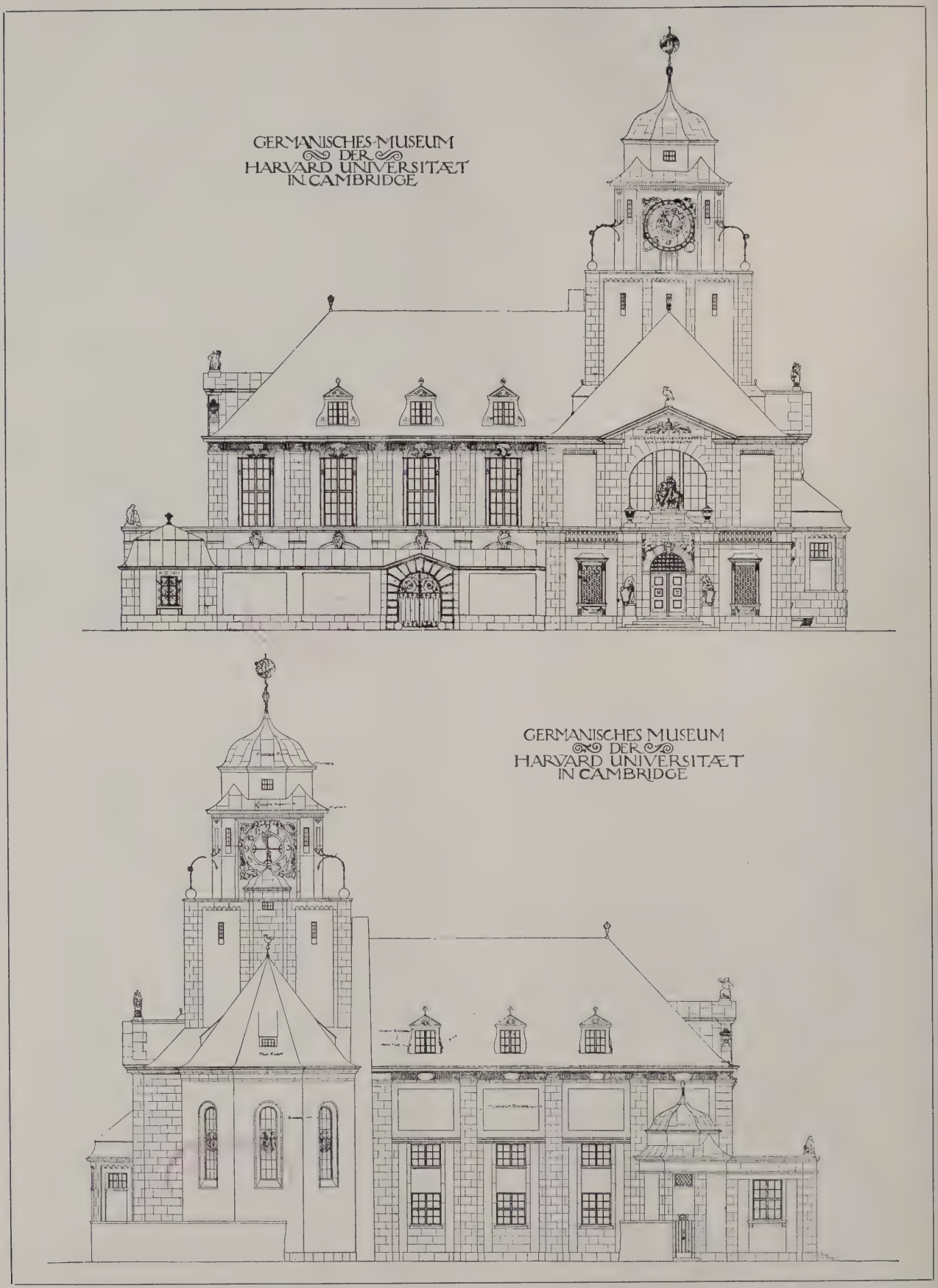
ing for our museum in Cambridge, which, instead of repeating the meaningless formulæ of classicist imitation, should be an original artistic expression of what this particular museum stands for,—the history of German culture. Together with Professor Warren, I arranged, in the summer of 1910, a meeting with Bestelmeyer, then a professor at the Dresden Academy of Art, and it was a delight at this meeting, held at a quiet inn near Goethe's garden house in Weimar, to see with what enthusiasm and deep understanding he entered into the matter. From the very first he saw that the building must be, above all else, an adequate setting for the objects constituting our collection, and that each of these objects,—casts of sculpture and architecture,—should, as far as possible, form an integral part of the structure, that they should be set against a background suggesting the time and the local surroundings of the originals, and that the whole building therefore should be a visible epitome of the various epochs through which German art has passed since the Karolingian era. And this is what the design, within the limitations set to it by available space and money, has indeed achieved.

I cannot refrain from mentioning that before we knew of Bestelmeyer, Professor Warren had himself drawn a tentative plan of a building for us, the elevation of which I published as a frontispiece of the first edition of my Museum Handbook. That after having become acquainted with Bestelmeyer's work he should not only have immediately withdrawn his own sketches, but should have devoted himself wholeheartedly to the most scrupulously exact and careful carrying out of the plan of his German colleague, is but another proof of the nobility of his character.

Perhaps the most striking impression on approaching the main entrance on Kirkland Street is that in spite of its small dimensions the building produces a decidedly monumental effect. This is due largely to the fact that in front of the main structure there stands out on the south side a breastwork, so to speak, of lower structures connected with one another, a continuous line running from a little square pavilion to a wall of cloistered arcades and thence to a little square vestibule back of the main entrance. This line of walled enclosures permits only a glimpse, through a wrought iron gate, of the decorative court lying back of it and shuts off the view of the whole lower story of the main building, thereby producing illusions of perspective which make the limestone and stucco walls of the second story and the massive red tile roof resting upon them appear much larger than they really are. This imposing effect is heightened by the complicated floor plan of the main building. It consists of two wings of unequal length, placed at a right angle to each other. The longer wing, containing the Romanesque and Gothic Halls, extends along Divinity Avenue, ending in a chapel-like apse; the shorter wing, containing



Plan of Garden Cloister, and Elevations on Garden Court



NORTH AND SOUTH ELEVATIONS
GERMANIC MUSEUM, HARVARD UNIVERSITY
PROFESSOR G. BESTELMEYER, ARCHITECT
WARREN & SMITH, ASSOCIATED ARCHITECTS

EAST AND WEST ELEVATIONS
GERMANIC MUSEUM, HARVARD UNIVERSITY
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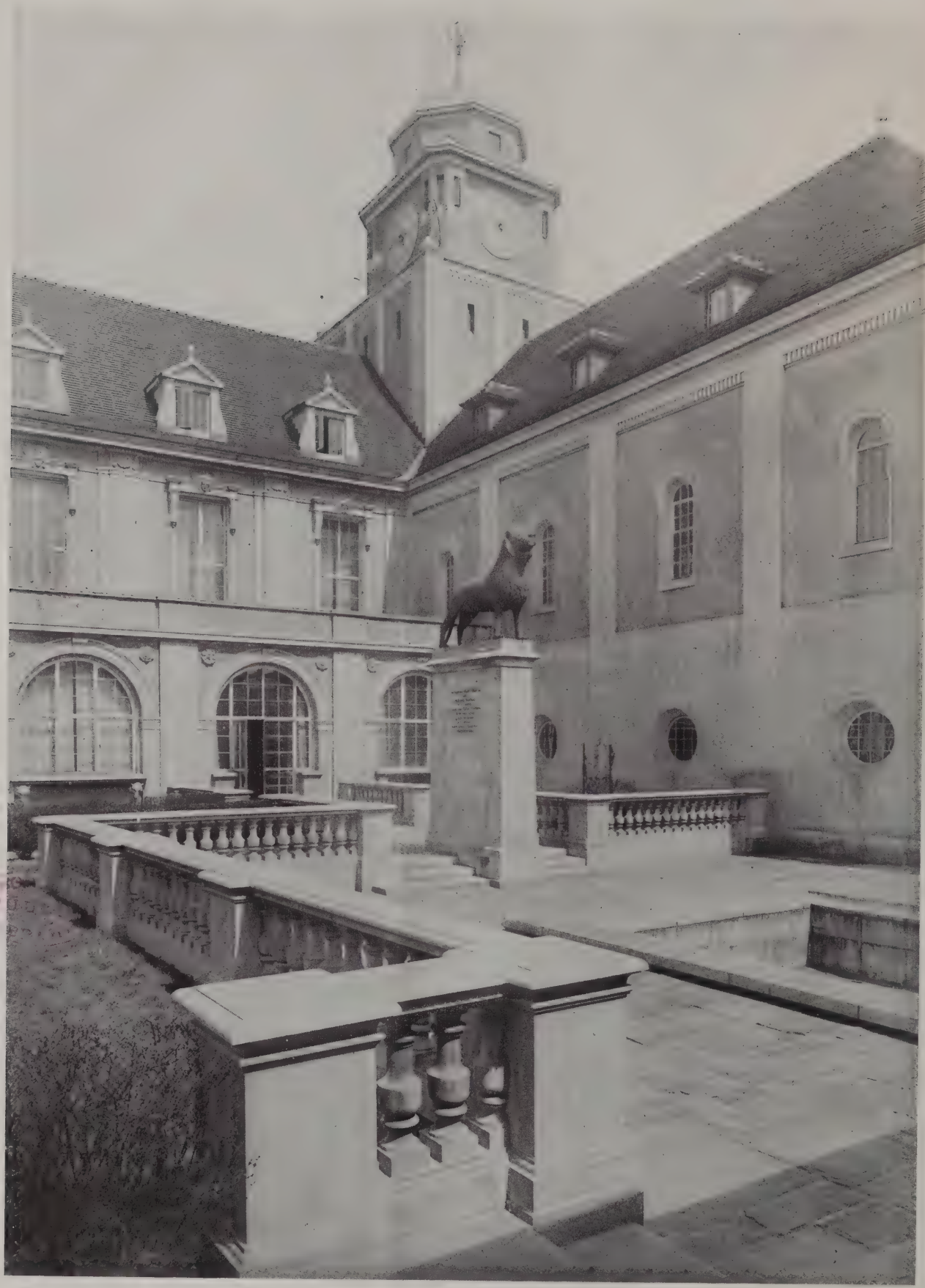


GARDEN COURT
GERMANIC MUSEUM, HARVARD UNIVERSITY
PROFESSOR G. BESTELMEYER, ARCHITECT
WARREN & SMITH, ASSOCIATED ARCHITECTS

NORTH END OF ROMANESQUE HALL

SOUTH END OF ROMANESQUE HALL

GERMANIC MUSEUM, HARVARD UNIVERSITY

PROFESSOR G. BESTELMEYER, ARCHITECT

WARREN & SMITH, ASSOCIATED ARCHITECTS

chiefly the Renaissance Hall, stretches from Divinity Avenue to Frisbie Place. The inner sides of the angle formed by them, together with the arcades just mentioned, form the enclosure of the decorative court. A terrace on the roof of the lower story of the Renaissance wing offers a particularly charming view of the details of this court, with its shrubbery, its stone water basin and balustrades, and its bronze replica of the Brunswick Lion. At the junction of the two wings there rises a massive tower of the full width of the wings, diminishing above the roof in receding stages, until at the height of 102 feet it ends in a crowning octagonal cupola. This tower more than anything else serves to hold all the parts of the structure together,—a structure marked by a happy combination of diversity and unity, of picturesque and monumental strength.

There is no lack in the exterior of the building of suggestions of the various epochs in Germany's art development. The round arch frieze, articulated by vertical bands, forms the prevailing ornament of the Romanesque tower, the chapel shows vaguely Gothic outlines, the window frames of the Renaissance wing in a general way suggest sixteenth century patterns, and there are classicist reminiscences in the pediment over the Divinity Avenue entrance. But nowhere is there over-emphasis of these differences of style; nowhere is there direct imitation of any particular work of the past, and nowhere are there sudden clashes of form. Light transitions and modifications of decorative detail lead from one type to another. The whole exterior constitutes one central conception and not an accumulation of unrelated parts.

Still more impressively does this harmonious blending of one central idea with a great variety of individual forms manifest itself in the interior of the building. Everywhere is there seen the attempt to suggest by the architectural construction some particular phase in the development of style. Everywhere the most important of the casts are used as organic parts of the structure. Everywhere there exists an atmosphere transporting the visitor into the spirit of the time from which each of these works of art arose. That there is a constant change of floor level as well as of height between the different rooms contributes to making the whole interior, like the outside of the building, appear larger and more monumental than it actually is. From a low vaulted passageway, suggestive of early mediæval convent corridors and containing a collection of Byzantine, Karolingian and Ottonian fictile ivories, a few steps lead down to the Romanesque Hall, about 40 feet in width and 60 in length, with an arched ceiling about 25 feet in span, intersected by four arched openings. Into the wall opposite the entrance there is fitted the cast of the Golden Gate of the Cathedral of Friedberg, in Saxony, through the opening of which a number of steps lead up to the next room, the Gothic Hall. This latter consists of two parts, an oblong transept and a hexagonal chapel, the two separated by a cast of the rood screen of Naumburg Cathedral. Thus the whole wing of the building, from first to last, presents the essential elements of a mediæval church, and the arrangement of all the various objects,—statues, tympanums, fonts, pulpits, choir stalls, tombs, crucifixion groups, etc., in what may be called the nave, side aisles, transept and choir, has a decidedly ecclesiastical and solemn effect. And yet, this church-like construction is not in any sense an imitation of a real church but rather an adaptation of ecclesiastical motifs to museum purposes, guided above all by the prime necessity of giving the visitor the opportunity to observe and study each of the exhibits in detail.

In a recent monograph on Bestelmeyer, the Berlin art critic, Fritz Stahl, has thus defined the characteristic quality of his style: "The combination of what serves the practical purpose with a higher element,—call it feeling or harmony or imagination or all of these together,—is perhaps Bestelmeyer's most essential trait. The rigid dogmatism of the most recent school of so-called pure objectivity is wont to look upon such a style as romantic or sentimental. We shall not be deterred thereby from calling it genuinely artistic and emphatically constructive. There has never been true architecture which did not desire to stimulate the æsthetic sense, the imagination, the soul. The great question is as to the fitness and the refinement of the devices for satisfying this desire. Bestelmeyer is particularly rich in such devices." From all that I have said about the Germanic Museum at Cambridge, it has become clear, I hope, that this building amply bears out the correctness of such words as these. Harvard University has every reason to be proud of possessing so worthy an example of the style of this German master.

It remains to say a few words about the man whose generosity made the carrying out of all these building plans possible,—the late Adolphus Busch, of St. Louis. Mr. Busch's was in many ways a remarkable personality. In every sense he was a man of large caliber. Passionately devoted to hard work and to business adventure, he was a royal spender and giver. He loved praise and honors, but was entirely free from petty jealousies and always ready to give due recognition to the achievements of others. He won the affection of all his workmen by his fatherly care for their well-being and his just appreciation of their needs. With a high sense of American citizenship he combined firm love of Germany, the country of his birth, and deep pride in her political and industrial ascendency. His patriotic hopes centered in seeing the United States and Germany leading the world in all higher public activities, and he was fully convinced that by endowing the Germanic Museum he was helping to realize this noblest dream of his life. It was a deserved tribute that at the hour of his funeral the City of St. Louis should have halted public and private traffic, and it was entirely fitting that the Corporation of Harvard University should have given to the building of the Germanic Museum the name "Adolphus Busch Hall."

ENTRANCE FRONT

Photos. John Wallace Gillies, Inc. *Plans on Back*

GARDEN FRONT

HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

SECOND FLOOR

FIRST FLOOR

PLANS, HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

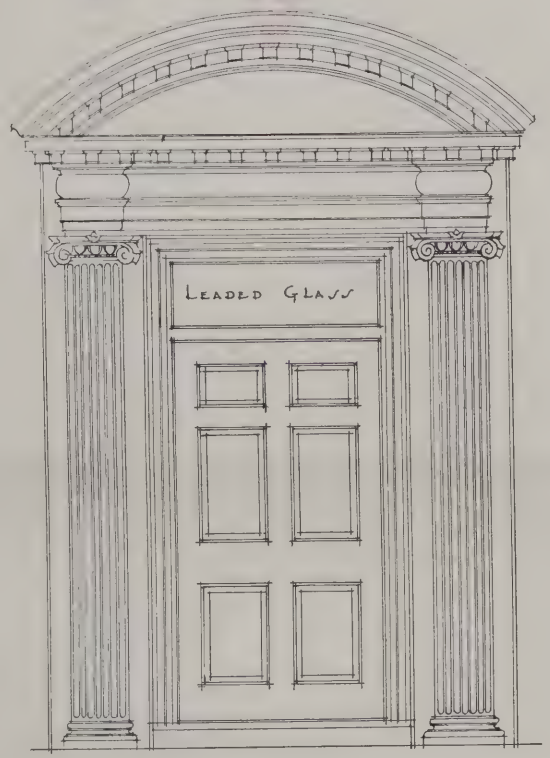
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

Detail on Back

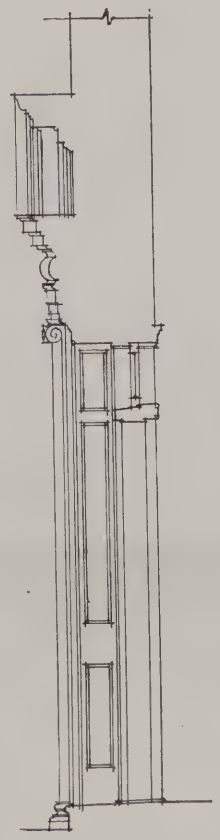
MAIN ENTRANCE

HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

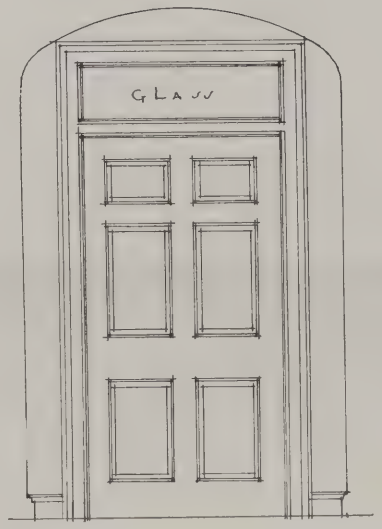
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



EXTERIOR ·

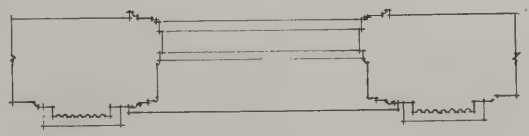


SECTION



INTERIOR ·

EXTERIOR SCREEN DOORS ·



PLAN ·

· FRONT ENTRANCE ·

SCALE

0 1 2 3 4 5 FT.

OCT. 1928

HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

No. 80

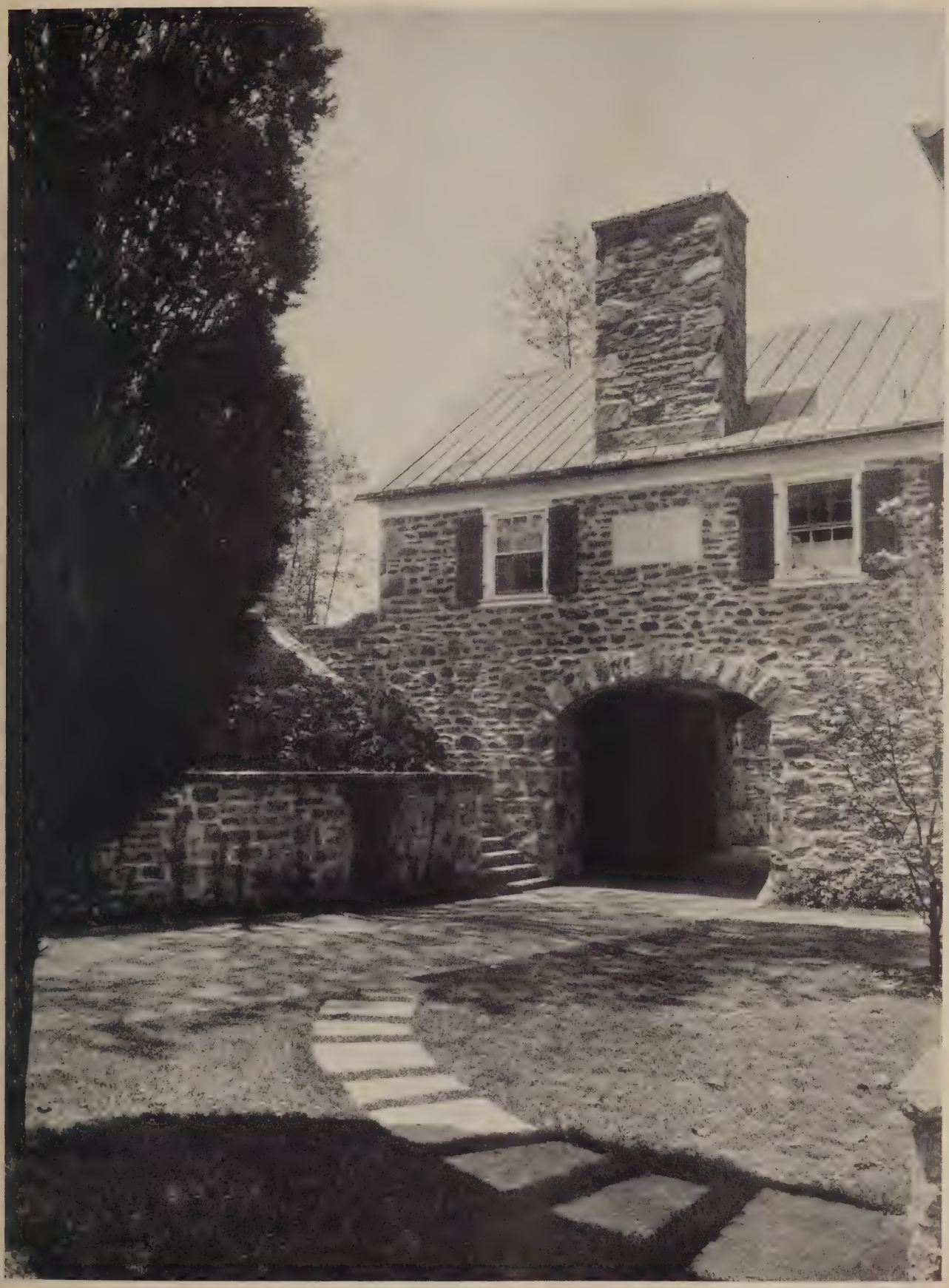
ONE END OF THE HOUSE
HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

GARAGE AND CHAUFFEUR'S QUARTERS

ENTRANCE TO CHAUFFEUR'S QUARTERS

ESTATE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT



ENTRANCE TO GARAGE COURT
ESTATE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

FARMER'S COTTAGE
ESTATE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

ENTRANCE GATEWAY

GARAGE COURT

ESTATE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

DINING ROOM

ENTRANCE HALL

HOUSE OF JOHN F. WILKINS, ESQ., ROCKVILLE, MD.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

HOME OFFICE BUILDING FOR THE MUTUAL BENEFIT LIFE INSURANCE COMPANY, NEWARK

BY
JOHN H. & WILSON C. ELY, ARCHITECTS

THE problem of planning and designing a home office building for a large life insurance company is, first of all, a business problem. The conditions of such a problem demand a thorough understanding, from the first, of the business methods and requirements of the institution. The Mutual Benefit Life Insurance Company until lately occupied a fine building, one of the landmarks of downtown Newark. In the course of a comparatively few years the Company had outgrown these quarters, and demanded more space for its business, with room for future growth to take care of a fairly certain rate of increase. It could be quite definitely estimated, knowing the size of each department, what would be the size of that department at the end of, approximately, a ten-year period. The property the Company had purchased required moving from the heart of the city to a location in an outlying section. More "elbow room" was thus to be provided. This, however, demanded an absolutely complete building,—one which would provide the employes with all requirements, such as dining rooms, rest rooms, gymnasium, etc.,—every convenience and comfort.

A careful study was made, first of all, by the architects, of the business and methods of the Company as a whole; next, a study of each department in the same manner,—the locations of the departments, those most directly in contact with the public, those most directly in contact with the administration, and those whose main service is with distant outside agencies, and also departments which function directly in connection with the social and physical welfare of the employes of the Company. A carefully worked up scheme was first devised to provide a building of maximum size to cover as much of the lot as would be required for the Company's ultimate needs. It was determined how large a building was required to care for the present business, with room for growth over a pre-determined number of years. Then the portion of the scheme not to be built as a part of the present program was divided into definite divisions, to be provided after

Photos. P. A. Nyholm

Main Corridor

Directors' Room

Mutual Benefit Life Insurance Building, Newark
John H. & Wilson C. Ely, Architects

AUDITORIUM

MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK

JOHN H. & WILSON C. ELY, ARCHITECTS

MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK
JOHN H. & WILSON C. ELY, ARCHITECTS

certain stipulated periods of time, following a well planned future building program. From this, the Company knew just where it stood, from the start of the new program well on into the future, in so far as building and equipment could be determined in advance. After the present and future were satisfactorily settled, that is to say when a present program which provided a workable future program had been made, the further detail work was devoted completely to the present building program to be undertaken.

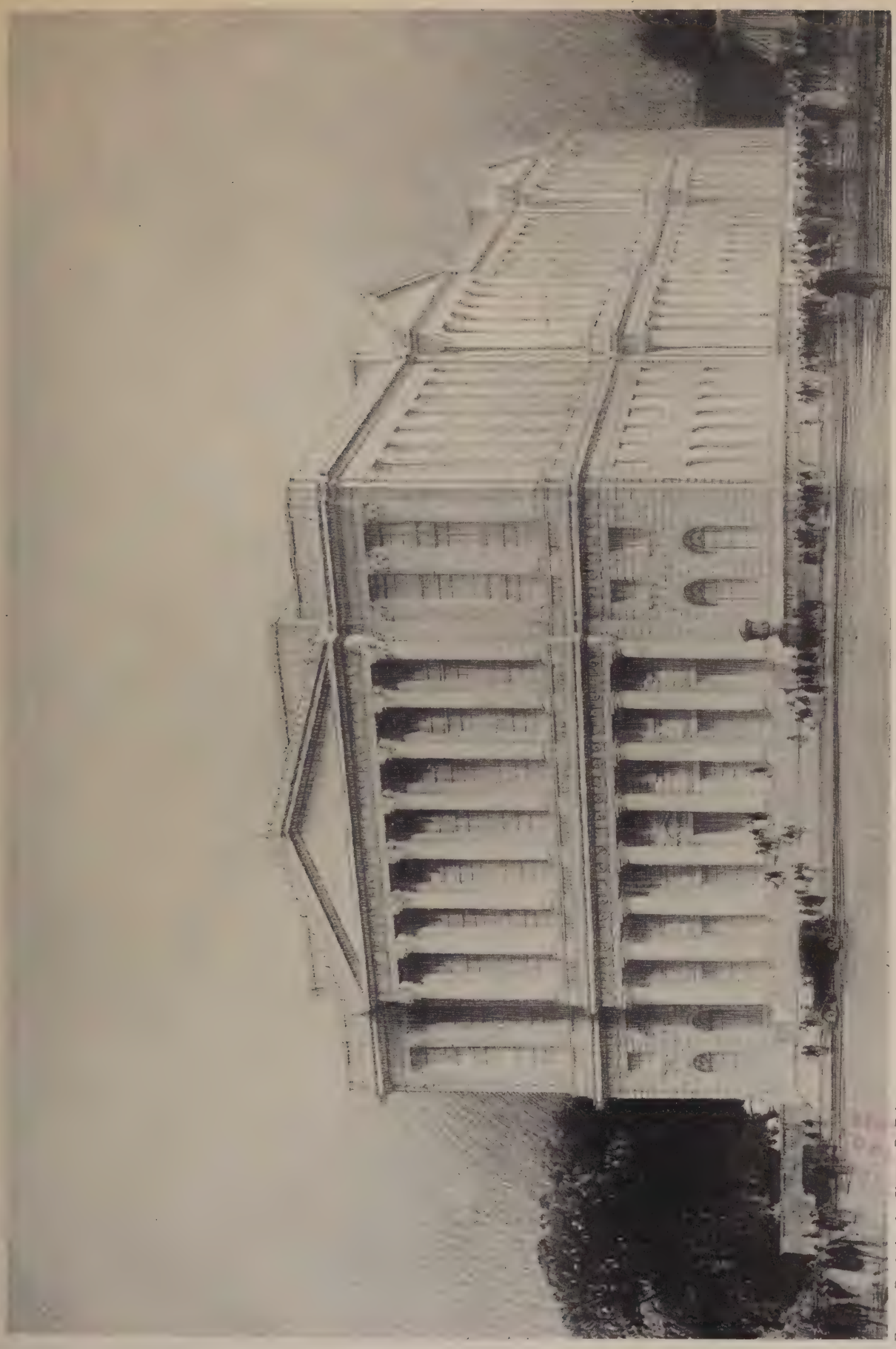
The structure was designed to provide a main building with two wings. The main building fronts on two important streets and is L-shaped, having a portico with several entrances on each street. One wing is devoted to service, such as elevators, toilets, locker rooms, etc. The other wing provides rooms for social activities, such as an auditorium and a gymnasium. There is an outlying building, adjacent to the service wing, but entirely separate from the main building, which houses a boiler plant for heating the entire structure. A study was made of the problem of elevator service to get employes from the street to their work and back again with the least amount of delay and the most efficiency. The plan provides for 12 cars; for present demands six were considered enough, but as growth continues under the present roof, other cars will be added in shafts now ready to take them. In a general way the basement provides for vaults and record files, with a large shipping and receiving room, a laundry, fan room, printing room, furniture repair room, and house electrician's room, with general service rooms of a like nature, a gymnasium,—fully equipped,—providing a standard basket ball court, four bowling alleys, lockers and showers and a visitors' gallery. This floor is also used for dancing upon certain occasions.

The first floor of the main building has two wide corridors, crossing at the center under a rotunda. On this floor are located the departments most in contact with the outside world. The elevator lobby is directly off the rotunda, flanked on each side with staircases. The auditorium is located in the service wing directly over the gymnasium, and it is so planned that it may be entered directly from the street without entering the main building. The floor and balcony of the auditorium together seat 1,000 people. The stage is thoroughly equipped to take any modern theatrical production, and has ample dressing room accommodations. The second floor is devoted to executive offices and board room, with mathematical and legal departments. In addition to the utilitarian rooms in the service wing, two dining rooms are provided for the Company's officers, with a serving pantry connected by a lift with the kitchen on the top floor. The balcony of the auditorium is not connected with the main building on the second floor level, save by a roof. A large outside motion picture booth is provided. The third and fourth floors have large open working areas for departments. The fifth floor provides a new business department with laboratory, doctor's rooms, and examination rooms used in connection with the work of examination of physical specimens, etc. used in connection with proposed new risks. The top floor is devoted mainly to a large dining room, with kitchen and pantry service. One wing is given over to infirmaries for employes, with male and female wards, this space being directly over the doctors' rooms below. Outside the dining room, back of the parapet, is an open tile roof, which is used as an outdoor promenade. The grounds about the building are laid out to provide automobile parking area as well as driveways.

Chandelier in the Rotunda

BOS PUBLIC LIBRARY

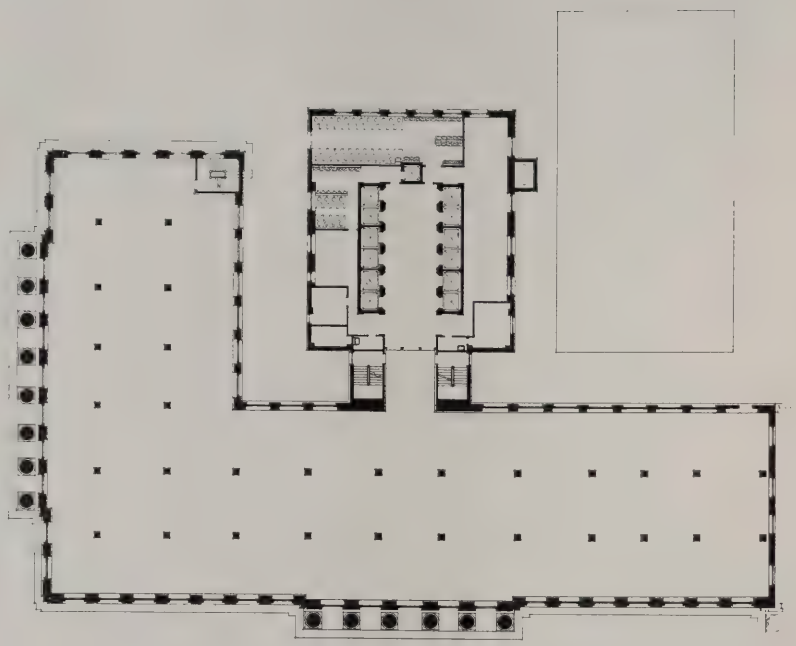
As far as the architectural treatment of the building is concerned, the architects desire to pay their respects to the monumental structure which the Company was obliged to vacate because of the growth of its business. It was of a past period of American architectural design, but a wonderful example of the best of that period, and it was an inspiration to have it to "live up to." In the new building it was felt that the architects had to express the strength of a large, important American business enterprise with the dignity and scale obtained by using a large but simple type of Classic architecture. This was their endeavor. But, after all, the judgment of the successful solution of any architectural problem rests with those who view the building and with those who use it,—and not with its architects.



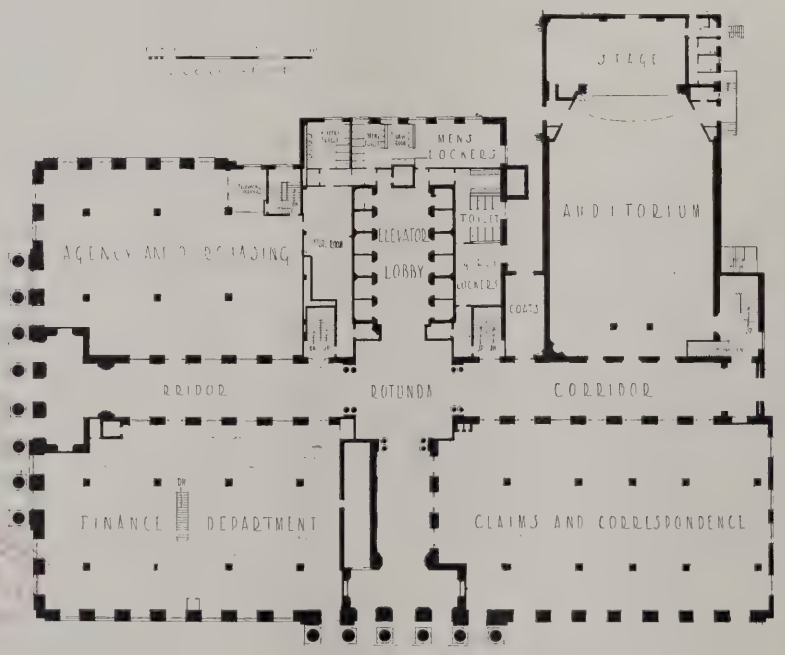
Plans on Back

MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK
JOHN H. & WILSON C. ELY, ARCHITECTS

From a Rendering by Chester B. Price



A TYPICAL FLOOR



FIRST FLOOR

PLANS, MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK

JOHN H. & WILSON C. ELY, ARCHITECTS

Photos. P. A. Nyholm

ENTRANCE PORTICO
MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK
JOHN H. & WILSON C. ELY, ARCHITECTS

ROTUNDA

MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK

JOHN H. & WILSON C. ELY, ARCHITECTS

ENTRANCE VESTIBULE
MUTUAL BENEFIT LIFE INSURANCE BUILDING, NEWARK
JOHN H. & WILSON C. ELY, ARCHITECTS

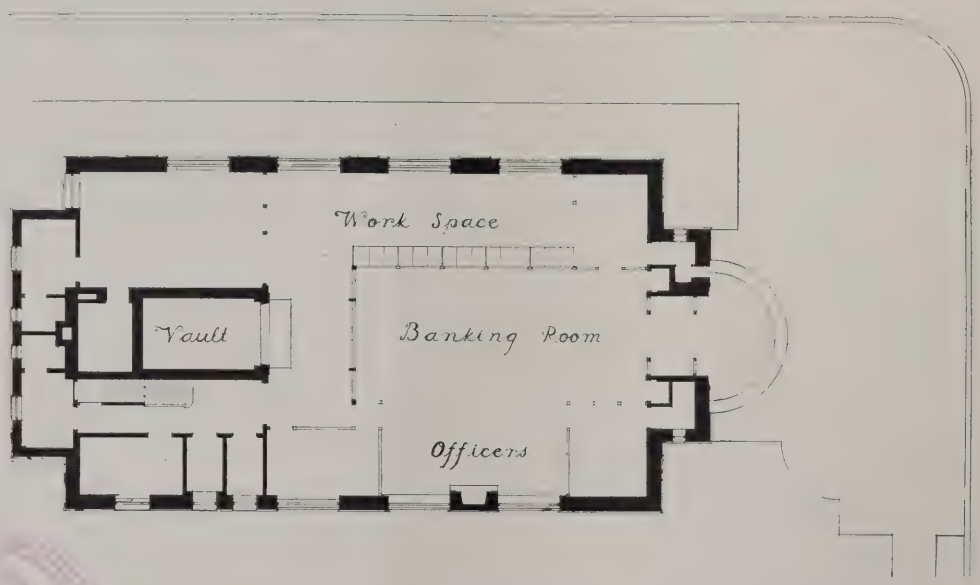
Plan on Back

GENERAL VIEW

CINNAMINSON BANK AND TRUST COMPANY, PHILADELPHIA

DAVIS, DUNLAP & BARNEY, ARCHITECTS

Photos, William M. Rittase



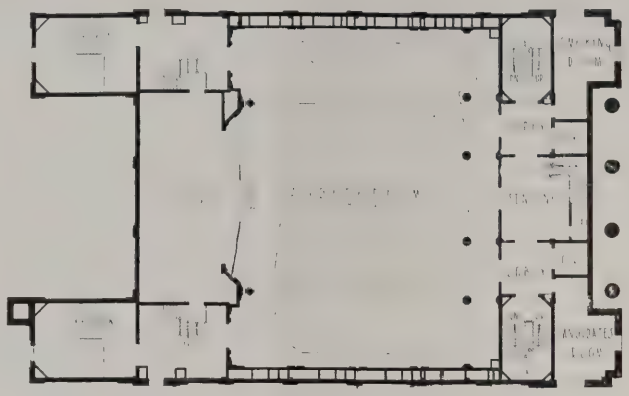
PLAN, CINNAMINSON BANK AND TRUST COMPANY, PHILADELPHIA

DAVIS, DUNLAP & BARNEY, ARCHITECTS

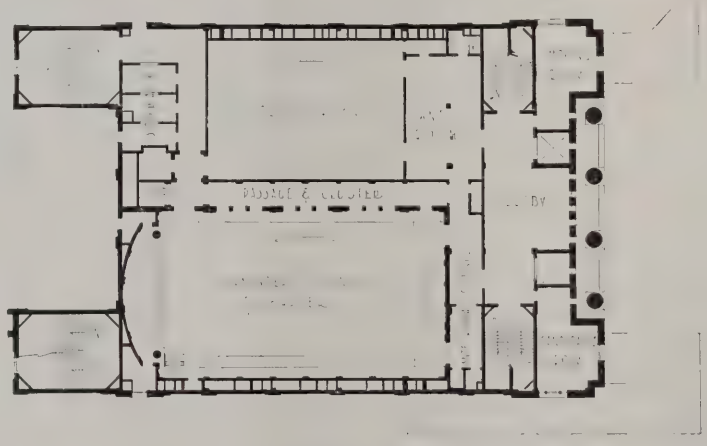
ENTRANCE DETAIL
CINNAMINSON BANK AND TRUST COMPANY, PHILADELPHIA
DAVIS, DUNLAP & BARNEY, ARCHITECTS

MASONIC TEMPLE, SPRINGFIELD, MASS.
McCLINTOCK & CRAIG, ARCHITECTS

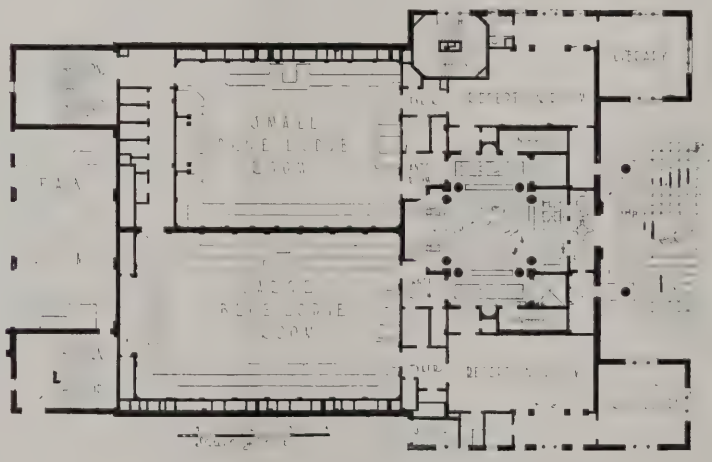
Photos. Paul J. Weber



THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

PLANS, MASONIC TEMPLE, SPRINGFIELD, MASS.

McCLINTOCK & CRAIG, ARCHITECTS

MAIN ENTRANCE
MASONIC TEMPLE, SPRINGFIELD, MASS.
McCLINTOCK & CRAIG, ARCHITECTS

NORTH HILLS GOLF CLUB

BY

CLIFFORD C. WENDEHACK, ARCHITECT

THE trend of club house design and construction in the metropolitan district has been marked in the past five years by many innovations. Club houses are beginning to acquire "personalities," both as a result of the activities of the memberships and the type and design of the buildings, for it will be found upon careful study that the characters of different memberships vary as much as the characters of individuals with regard to their habits, tastes and general modes of living. The North Hills Golf Club has something of this personality, for it is situated on one of the highest spots on Long Island, with gently rolling hills and sandy soil, suggesting in its general character portions of provincial Spain. It seemed but natural that the Spanish style be employed, with an idea that the Spanish atmosphere could be created in the immediate vicinity by landscaping. Another governing factor making for the employment of this style was the type of the club's membership, which demanded a comfortable atmosphere accompanied with dignity for personal entertainment as well as a background on a par with the best hotels in the South, and a reminder, during the golfing season, of the play days spent at America's greatest winter resorts. The advertising sense of the times was also a contributing factor, since it was found that a building erected on such a prominent site would be visible for many miles over the surrounding country. The orange and red roof is proving this to be the case, for the tower treatment over the grill has already become a distinguished landmark.

Club house planning in recent years has been entirely revolutionized, primarily because golfers' requirements have grown by leaps and bounds until the frame of mind at the present time of new building committees is such that they are not contented unless their clubs possess more in many ways of convenience and size than their neighbors'; larger lockers, more area in their dressing room accommodations, and commodious showers, form a basis of their demands. The popularity of the club house as a scene of entertainment has increased tremendously during the last few years, with the men, and still more with their wives,—as it is considered more economical and more convenient to entertain at a club than in one's home. The popularity of the game with women in general has perhaps tripled the number of active women golfers throughout the country during the past five years, until their separate demands and the extent of their accommodations have become almost as great as those of the men. These factors alone have been responsible for the ever-increasing costliness of an up-to-date club structure and have caused many interchangeable relations of the component parts of the building.

The proper relation of the building to the golf course has also become an important factor. The handling of great numbers of cars and the starting and finishing of men and women golfers in close succession throughout the golfing season make it

From a Rendering by the Architect

North Hills Golf Club, Douglaston, N. Y.
Clifford C. Wendehack, Architect

Grill Room Fireplace

imperative not only to have the locker rooms in close proximity to the starting points of the course and the parking space for comfort, but also to have the porches and living portions of the club properly orientated for shade and prevailing breezes. A close study of the North Hills plan in relation to the course reveals how conveniently it is related to the first and tenth tees, with an ideal position for the ninth and eighteenth greens within full view of the porches and terraces. This close relation of the home greens to the building not only saves much unnecessary walking but is an actual factor of safety in crossing roads, and a money-saver with regard to guests on the starting time. This was made possible by the preliminary coöperation by the course architect and the architect for the building, and it demonstrates most satisfactorily what can be done when building committees heed the advice so often given them by both architects to let them work out the problem together before planning of either course or building assumes form.

The main entrance to the North Hills club house is protected by a stone *porte cochere* which opens directly into a vaulted lobby, adjoining which are

Photos. Kenneth Clark

Lounge, with Dining Room Beyond
North Hills Golf Club, Douglaston, N. Y.
Clifford C. Wendehack, Architect

the office, coat room, women's room and main stairs, and the women's entrance leading to their quarters and lockers on the second floor. Opening from this lobby there is a wide loggia which affords means of communication to the grill, dining room and lounge which are arranged in such a manner that they can be converted into one large area for entertainment, thereby economizing space under normal conditions and affording ample room for large gatherings on special occasions. An unusual effect, which adds to the spaciousness of the lounge, is the two-story hall treatment with its clerestory windows and decorative trusses. At one end is a huge fireplace, and a gallery at the side overlooks the entire floor area. Porches are provided to the west and south of this room, connected with flagstone terraces extending past the dining room and completely encircling the grill, permitting the dining and drinking out of doors so much in vogue. The locker room is placed at an angle from the main club house in order to connect directly with the first tee and to obtain a southeast exposure for the main building. It may be entered from the main hall or from the spacious men's lobby directly from the

Dining Room Fireplace

Entrance Lobby, with Dining Room Beyond
North Hills Golf Club, Douglaston, N. Y.
Clifford C. Wendehack, Architect

main driveway. This separate entrance for the men will prove a very popular feature. It is octagonal in shape, and from each of its eight sides is an opening leading to the men's locker room, coat room and wash rooms. Over the first floor is a wide light well running the entire length of the locker room, and directly over this is provided a continuous row of skylights. Ventilation is provided over each row of lockers and around the entire roof area, making an unusually light and freshly aired room. A covered loggia or porch is provided on the second floor as well as on the first. It is furnished with card tables and easy chairs for golfers who wish to lounge about in informal attire.

The vista down the loggia illustrates better than any words can do the relationship between color of material and forms. The loggia furnishes the keynote for the entire club and was inspired by the old hospital at Vich, Catalonia. The floors of this room are of dark red and yellow tiles, highly polished. The walls are rough hand-made plaster and are treated dead white with old style kalsomine. The ceiling is antiqued rough lumber with brilliant orange, blue, green and black stencils. The colors of the floor, walls and ceiling are recalled in the draperies and pieces of pottery, which latter form not only spots of color but, being filled with sand, are ideal for ash receivers. While the ensemble is startling and usually calls forth an exclamation of surprise, it is restful and extremely cool in effect.

The lounge and dining room express the general result obtained by contrasting scale of rooms. The effect of coziness in the dining room and spacious freedom in the lounge affords a contrast which makes for an unusual atmosphere at social affairs. Here the color key is carried to its highest pitch, starting with the coloring of the antique drapery over the balcony and in the carpet which is of brilliant oranges, yellows and blues. The two Spanish iron grilles separating these rooms are removable when the rooms are thrown into one. The dining room probably contains more color, both in the room proper and on the tables, than has ever before been attempted in club decoration. The walls are rough, bumpy plaster antiqued to a mellow orange hue. The beams are natural wood color, decorated in blues, greens, whites and blacks, and they blend into the walls, except for their ornamentation. The ceiling is a green-blue, recalled again in the chair coverings, which are peacock green. The unusual use of arm and side chairs develops an atmosphere of informality. The table coverings are natural Spanish linen, furnishing an ideal background for the colorful Deruta china of individual designs and various colors. The mantel in this room focuses all its color on the Spanish horseman plaque, done in the same color as the wall, and the antique Renaissance fire screen. The novel use of wrought iron gates with stone supports in place of a fire screen, creates a new note in fireplace treatment.

The men's grill is truly masculine in its scale and simplicity of treatment. The brown and orange floor is an excellent resistant to hob nails. The rough plaster walls are treated with soft green tones, which are recalled in the beam treatment of the ceiling. The huge fireplace on the left burns 5-foot logs, whose warmth can be felt throughout the room. The cloisonne vases on the fireplace shelf frame a fine piece of Spanish mosaic in tones of black, white, red and green, with a gold field containing the names of the officers who were associated with the erection of the building. The stairway to the left of the main entrance, leading up to the women's lounge and locker rooms on the second floor, is constructed of red tiles and black marble treads with iron handrail and twisted balusters. It is a feature which is interesting without being ostentatious. The white walls of the loggia are continued out into this lobby and on the second floor. A novel adaptation of a bulletin board, so often an unsightly object in the main entrance, is secured by the use of an old Spanish mirror frame with cork board insert for posting notices. It admirably serves a utilitarian function.

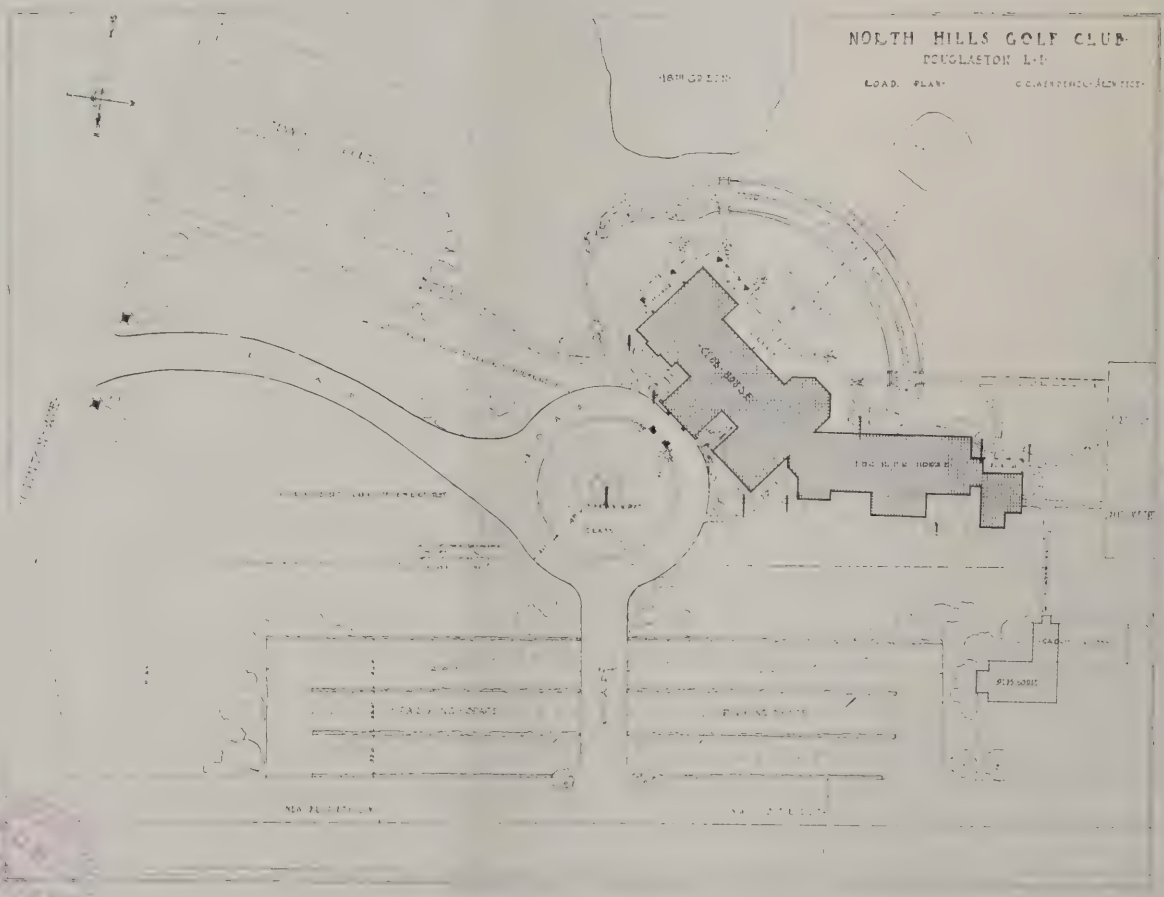
The inspiration and benefits to be derived from rich coloring and correct forms in club buildings are at last being recognized as an important factor in their success. The atmosphere created by color and form unconsciously affects the frame of mind of every club member, producing within him, at its best, satisfaction and poise, which will be reflected not only in his improved score on the course, but in the general harmonious attitude toward his fellow members and the employes of the club. Scientists declare that color is a positive force which affects our nervous systems, probably by an electrochemical activity, and that all persons with normal eyesight feel its influence. This influence is based upon the stimulation of the senses which results when white light, broken by reflection into its various wave lengths, falls upon our vision, so that instead of somber grays we see varying hues which appear to add a kind of vitality to forms. Each hue exerts its particular effect upon us, and the impression is so specific that even animals and insects appear to have marked preferences for certain colors which seem to affect their behavior. The ideal state of mind produced by right color environment must be assisted by a smooth working of all practical parts. The sequence of rooms, their sizes, character and functioning must unconsciously serve the members with ease and convenience. Economy of steps, speed, and the certainty of having every want immediately supplied at their command must be assured before their æsthetic natures can be appealed to. The North Hills Golf Club's building committee realized this fact and permitted the architect and decorator a free hand in determining the layout of the plan, the character of the various units and the color combinations, in fact they were permitted to use more color in a bolder manner than up to the present time has been done in club work. The result is original, bold, and highly interesting.

Photos. Kenneth Clark *Plan on Back*

LOUNGE

NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.

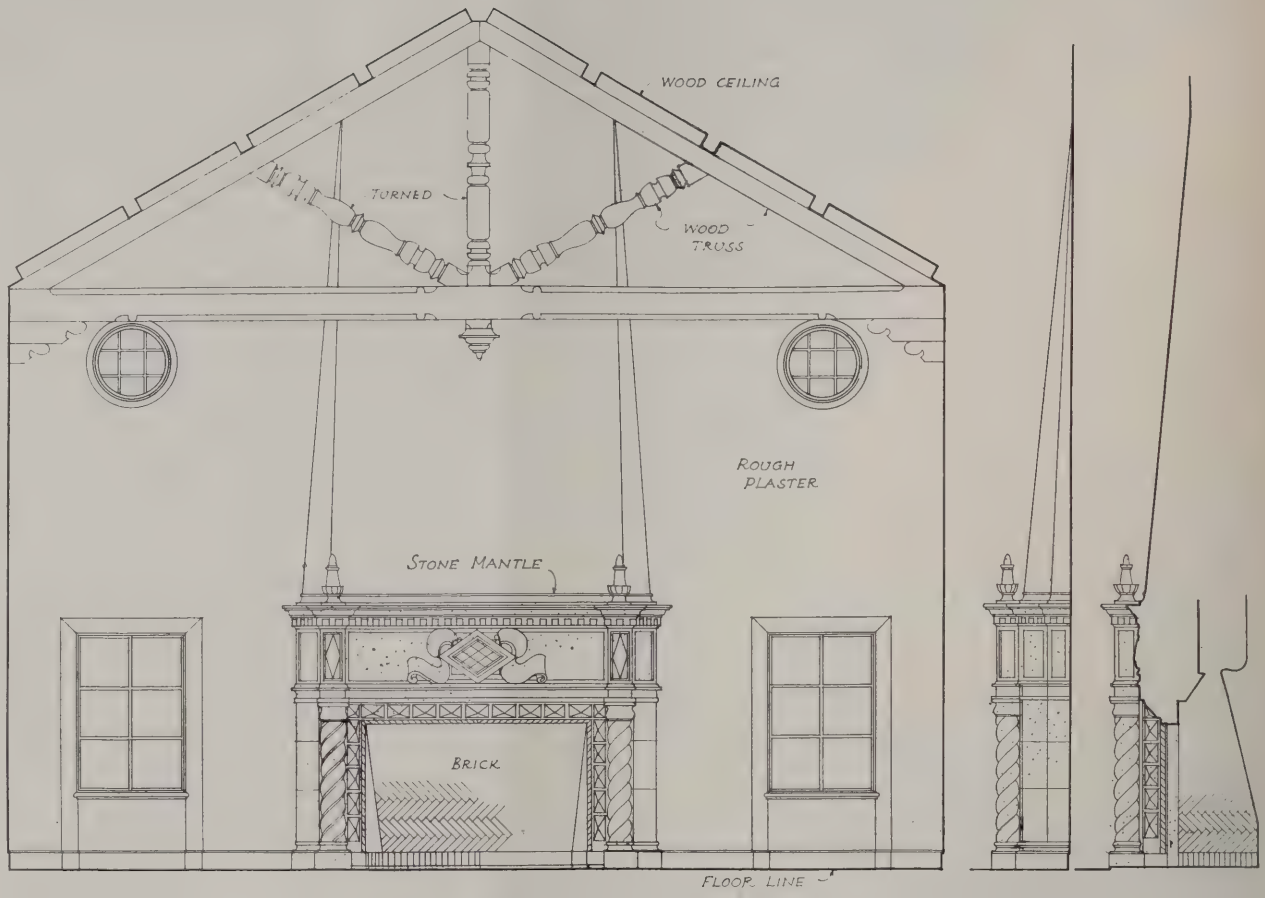
CLIFFORD C. WENDEHACK, ARCHITECT



PLOT PLAN, NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

ARCH BETWEEN LOUNGE AND DINING ROOM
NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

Detail on Back



LOUNGE DETAIL

NORTH HILLS GOLF CLUB DOUGLASTON, LONG ISLAND N.Y.

C. C. WENDEHACK, ARCHITECT, NEW YORK CITY

5 0 5 10 15

SCALE IN FEET

OCT. 1928

No. 81

Detail on Back

STAIRWAY TO WOMEN'S LOUNGE
NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

No. 82
Section
Elevation
BALCONY
WOOD BRACKETS
OPENING
WOOD BALCONY
OPENING TO DINING ROOM
FLOOR LINE
WOOD CEILING
CARVING
WOOD BRACKETS
LEADED GLASS
ROUGH PLASTER
LOUNGE DETAILS
NORTH HILLS GOLF CLUB, DOUGLASTON, LONG ISLAND NEW YORK
C. C. WENDEHACK ARCHITECT, NEW YORK CITY.
SCALE
OCT. 1928

DINING ROOM, FROM LOUNGE

NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.

CLIFFORD C. WENDEHACK, ARCHITECT

LOGGIA
NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

ENTRANCE HALL, FROM DINING ROOM
NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

WROUGHT IRON GRILLE BETWEEN LOUNGE AND DINING ROOM
NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.
CLIFFORD C. WENDEHACK, ARCHITECT

DINING ROOM

MEN'S GRILL ROOM

NORTH HILLS GOLF CLUB, DOUGLASTON, N. Y.

CLIFFORD C. WENDEHACK, ARCHITECT

SANTO DOMINGO
THE SITE OF THE COLUMBUS MEMORIAL

BY
EDWIN LACLEDE HOWARD

FROM Porto Rico, which is four days' journey from New York, an overnight trip on the boat brings one to the old Spanish colonial city of Santo Domingo, the capital of the Dominican Republic and the site of the Columbus Memorial Lighthouse, toward which the eyes of the architectural world will be turned during the international competition for its design and plan, which is very shortly to be held.

The boat leaves San Juan, Porto Rico, as the setting sun throws its last rays on the magnificent fortress at the mouth of the harbor, and when daylight comes again, the island of Haiti, the eastern three-quarters of which is held by the Dominican Republic, appears apparently floating on the water. The calm sea dashes itself with unexpected violence in long lines of breakers against the narrow strip of coral rock which forms the shore. There are few beaches, and the low cliffs are crowned with great palms and in the far distance, like vague clouds, there may be seen the outlines of mountains. The sun's rays beat down with a merciless intensity, which is somewhat relieved by the trade wind from the east, which, seemingly actuated by clockwork, starts to blow. Soon we come upon the mouth of the Ozama River and catch our first glimpse of the proposed location of the lighthouse and of the old city. To the east of the river, a strip of coral rock, bearing palms and other large trees, pushes its way out into the white breakers and the marvelously blue sea. Save for the gray, vine-clad ruins of an old chapel, there are no signs of human habitation. On the west bank are one- or two-storied stucco houses,—pink, red, yellow and white, with pink predominating; here and there a low, dark mass of a church or monastery roof may be seen. To the west, the buildings dwindle away amid groves of cocoanut palms.

On the shore, still pounded by breakers, is the wreck of the U. S. S. "Memphis," a warning not to forget the West Indian hurricanes which sweep these shores during the summer months. Our ship anchors in the open roadstead, and a tiny launch, performing marvelous convolutions, carries the passengers toward the shore. As the river is entered, the memorial site, to the left, stretches along with a slight rise from the sea, deserted. The city becomes dominated by the fortress called the "Homage Tower," which was the chief bulwark of the old walled city. This tower was built when the city was moved from the opposite bank in 1503; the first settlement was by Don Bartolome Colon, or Columbus, brother of the discoverer, in 1486. An engineer-architect, Don Cristobal de Topia, came from Spain especially commissioned for the work, as the Spanish saw the need of having a stronghold in this, the governing city of

North Facade, Cathedral of Santo Domingo

Entrance, Casa Diego Colon

Doorway, the Old Mint

the Indies. Their judgment was confirmed, since later the wealth of Mexico and Peru flowed through this port on its way to add to the greatness of the old country. An illustration of this tower from the land gate is given on page 540.

The launch ties up before the gate of San Diego, illustrated on page 543. The wall is pierced diagonally by the gateway, which is surmounted by a curious moulding which curls itself up to be received upon a Spanish Renaissance motif. The gate is a scene of much activity. Along the quay are small freighters, tied up where the boats of Pizarro and Cortez were made fast, unloading crates of American automobiles, American canned foods and potatoes, Scandinavian lumber, and taking on cargoes of sugar and bananas. Inside the gate, to the right and dominating it on a small hill, are the ruins of the Casa de Diego Colon. The residence of the son of Christopher Columbus, or Cristobal Colon, was built by him in 1510, and it was to this palace that he brought his bride, Maria de Toledo, cousin of King Ferdinand of Aragon. From this building he governed the Spanish colonies; it was occupied by his family for several generations, and here Don Bartolome Colon, the founder of the city, died. The illustration of the ruins on page 542 shows something of the character of the masonry. The walls, over 2 feet thick, are of the local coarse, brown-gray coral rock, pieced out here and there with long Roman brick. The plan is H-shaped, and the fragments of the arcades closing the ends of the H are still clearly discernible. The windows are mostly elliptical, and some of them still retain their Gothic cusps. The mouldings are crude and probably, like the walls of the building, were coated over with stucco. The finest bit of detail still existing is the entrance from the land elevation, which was probably entered through the arcade.

From the gate of San Diego very narrow streets lead up into the city. The low buildings, one and two stories high, have occasionally an interesting motif, but for the most part are simple and massive. Iron grilles keep the general public from walking into the parlor, which is usually at the front and on the street level; behind this room is a second, and then an open patio, behind which is the kitchen with its earthen stove, burning charcoal. The door shown in the illustration on this page is that of the old Royal Mint which was the first building of its kind to be erected in this country. Such relics of the past as this should be preserved, and in the memorial competition program there is included a museum in which it is to be hoped that this old doorway may be saved from the encroachments of modern times. The door itself is painted pale blue; the ornament is whitewashed and stands out brilliantly against the Pompeian red walls. This bold use of color is one of the most striking things about Santo Domingo.

The door to the shop shown upon page 544 is surrounded by coral stucco and surmounted by a white

Doorway, Convent of Santa Clara

Entrance to a Private House

stucco lintel, at the ends of which are small brackets supported by cherub heads. The cornice is typical, built of brick with stucco mouldings "run over" them. As there is no frost, stucco is a fairly durable material. The severe entrance of the convent of Santa Clara, shown upon this page, was built during the early part of the fifteenth century, and in the pediment there is a fine polychrome effigy of Santa Clara holding a reliquary. Inside the doorway is a great and beautiful room whose solid mahogany rafters are supported on Gothic arches. Iron water spouts, which throw the rain over the narrow sidewalk, remind one that during the rainy season the heavens frequently open and pour forth a short-lived but mighty deluge. The similar doorway, shown upon this page still retains its original wooden door, which has never been painted, and which has now the soft dove color of old driftwood. The window grille beyond is very typical, with its moulded cornice and sill. Behind such grilles as this are wooden shutters (there are no glazed windows), which serve to keep out the heavy rains and the noonday sun. During the daily two-hour siesta, throughout the city, these blinds are closed, and the streets are deserted.

The ruins of the church and monastery of San Francisco are among the most imposing monuments of the city and contain interesting fragments of Gothic vaulting. The heavy masonry walls, sometimes 3 or 4 feet thick, are a reminder to present-day designers that this country is subject, fortunately not frequently, to earthquakes, and that structures must be built in the most substantial manner possible.

The chief center of interest to a visiting architect is the lovely old cathedral of Santo Domingo. Its construction was started in 1514, under the direction of an architect named Rodriguez, who came from Spain, and in 1540 the church was dedicated. The interior is chiefly Gothic in feeling, with a very wonderfully vaulted nave, but the exterior felt the influence of the Renaissance, as may be judged from the sketch of the west, or main, facade, an illustration of which is given in this issue of THE ARCHITECTURAL FORUM. It was to this old building that the bones of Christopher Columbus were removed from Havana, and today, according to very substantial evidence, they rest in the nave of the cathedral directly in front of the main entrance. The north side of the cathedral is shown upon page 537 and is typical of the peculiar type of design used throughout the city. It was erected probably by Indian laborers who did not understand just what was required of them. The color is the soft gray which all the local masonry assumes if left undisturbed. A visit to Santo Domingo gives an architect a closer insight into the lives of the earlier discoverers. It shows the type of building to which they were accustomed, and it furnishes inspiration to us today, to help solve our problems of construction in a happy manner.

ENTRANCE TO THE FORT, SHOWING THE "HOMAGE TOWER," BUILT IN 1503

From a Litho-pencil Sketch by Edwin Laclede Howard

CATHEDRAL OF SANTO DOMINGO

CASA DIEGO COLON

SAN DIEGO GATE

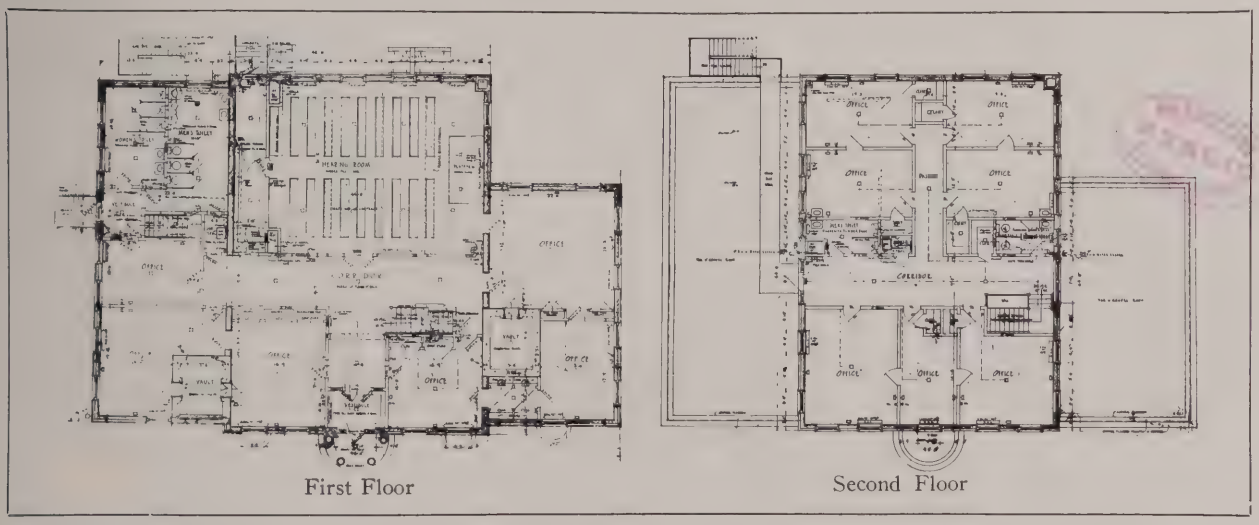
A SHOP DOOR

Photos. Frances Benjamin Johnston

TOWN OFFICE BUILDING, HYANNIS, MASS.

J. WILLIAMS BEAL, SONS, ARCHITECTS; L. FRANK PAINE, ASSOCIATE ARCHITECT

DURING the past few years there have been a great many excellent small public buildings erected in different parts of the country. Space does not permit us to publish in this section many of these small but interesting designs. We have, therefore, chosen a group of buildings differing greatly in character of design and point of location. The first of these small buildings is the new town building at Hyannis, Mass. This is a simple Colonial structure, comprising a two-story central building balanced on either side by a one-story wing. A classic cornice with brick parapet above emphasizes the top of the main building, while simpler cornices and parapets crown the two low wings. Arched windows and a semi-circular porch of rather heavy classical design emphasize the main story and entrance to the building. On the first floor is a large hearing room or town hall. Suites of offices occupy the rest of the first floor. A stairway at one side of the entrance hall leads to a second story, where seven smaller offices are located. This second floor is so planned that the one-story wings may be built up another story and connected with it by means of doorways at either end of the center corridor. The style of architecture chosen for this building is more English Georgian in its character than Colonial, but this style is what the Colonial was derived from, and its use is quite consistent with architectural propriety.



First Floor

Second Floor

COST AND CONSTRUCTION DATA

Town Office Building, Hyannis, Mass.

J. Williams Beal, Sons, Architects; L. Frank Paine, Associate Architect

DATE OF COMPLETION: July, 1927.

GENERAL TYPE OF CONSTRUCTION: Concrete foundations; exterior walls, brick with tile backing; first floor concrete, second floor and roof, wood framing; steel stairs.

EXTERIOR MATERIALS: Waterstruck brick with wood trim.

ROOF: Tar and gravel, with copper flashing.

FLOORS: First floor, terrazzo, rubber tile and linoleum; second floor, hard pine.

HEATING: Vapor system. Magazine feed boiler, burning buckwheat coal. Direct radiation throughout, with indirect heater for fresh air supply to hall.

INTERIOR WOODWORK: Birch and whitewood.

INTERIOR WALL FINISH: Plaster.

INTERIOR DECORATIVE TREATMENT: Plain painting.

APPROXIMATE CUBIC FOOTAGE: 156,500.

COMPLETED COST PER CUBIC FOOT: 51 cents.

TOTAL COST: $79,336.49.

Main Entrance

Town Office Building, Hyannis, Mass.

J. Williams Beal, Sons, Architects; L. Frank Paine, Associate Architect

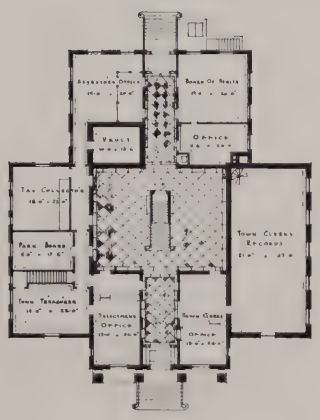
Photos. Frances Benjamin Johnston

ADMINISTRATION BUILDING, MANCHESTER, CONN.

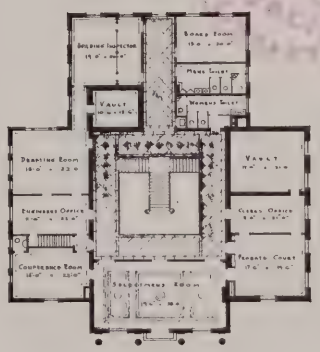
FRANK C. FARLEY AND WILLIAM HARMON BEERS, ASSOCIATED, ARCHITECTS

HERE is a building thoroughly monumental and consistent with its location and purpose. Located in one of Connecticut's oldest and most aristocratic communities, dignity and distinction are secured through the sizes of the windows, the heights of the walls, the restrained and refined Colonial details of the entrance portico, with its rich entablature and pediment executed in white marble, and the tall, graceful, well proportioned cupola. The location of this town hall on the ridge or plateau which dominates the town is particularly fortunate. Together with the fine Colonial church just beyond, a most harmonious group is formed, almost giving the semblance of a town center. The similarity in scale

Basement



First Floor



Second Floor

ENTRANCE PORTICO

ADMINISTRATION BUILDING, MANCHESTER, CONN.

FRANK C. FARLEY AND WILLIAM HARMON BEERS, ASSOCIATED, ARCHITECTS

BOSTON PUBLIC LIBRARY

ENTRANCE DETAIL

ADMINISTRATION BUILDING, MANCHESTER, CONN.

FRANK C. FARLEY AND WILLIAM HARMON BEERS, ASSOCIATED, ARCHITECTS

COST AND CONSTRUCTION DATA

Administration Building, Manchester, Conn.

Frank C. Farley and William Harmon Beers, Associated, Architects

YEAR OF COMPLETION: 1927.

GENERAL TYPE OF CONSTRUCTION: Basement walls, concrete; first and second story walls, hollow tile brick veneer; vault walls, solid brick; floor construction, hollow tile and reinforced concrete.

EXTERIOR MATERIALS: Selected common brick.

ROOF: Mottled green and purple slate laid on 2-inch plank supported on steel framing.

FLOORS: Finished floors in halls and corridors, terrazzo; offices, linoleum.

HEATING: Vapor vacuum system; provision made for heating former Hall of Records, located across the street.

ELECTRICAL EQUIPMENT: Circulating pump for heating system.

INTERIOR WOODWORK: White pine; doors, birch.

INTERIOR WALL FINISH: Painted plaster.

INTERIOR DECORATIVE TREATMENT: Walls buff; trim and ceilings, white enamel.

APPROXIMATE CUBIC FOOTAGE: 294,000.

COMPLETED COST PER CUBIC FOOT: 57½ cents.

TOTAL COST: $169.270.

and character of the detail of the town hall and the church is fortunate and pleasing. An even more monumental character is secured in the former by the use of the Corinthian order contrasting well with the Tuscan order used in the church beyond. The first floor of the building is sufficiently high above the grade to permit the locating of numerous storage rooms and vaults on the basement floor. As the building is of fireproof construction throughout, these basement rooms can safely be used for the storage of valuable documents and records. The plan is practical, well balanced and convenient. On the first floor are located the various offices of the town officials, grouped around a center hall, which has a monumental stairway and balcony above railed with interesting ironwork. At the front of the second floor is a spacious room for the use of the selectmen. No auditorium was included in this town structure, because the high school building not far away has an auditorium of sufficient size to accommodate large town gatherings. The interior detail is all of Colonial character appropriate to the exterior design of the building. White painted woodwork, deep toned walls and mahogany doors carry out the public character.

Stair Hall

Entrance Lobby

Administration Building, Manchester, Conn.

Frank C. Farley and William Harmon Beers, Associated, Architects

Photos. F. E. Geisler

FIRE HOUSE, PALM BEACH

CLARK J. LAWRENCE, ARCHITECT

Roof

THE Spanish style has been consistently and attractively used in the design of this fire house at Palm Beach. It is always gratifying to see an experiment in architectural design successfully carried out. The irregular plan and grouping of the different parts of this design are interesting. The apparatus room, which is the chief part of any fire house, is the chief feature. Three large doorways designed in the manner of an open arcade are surmounted by a long covered gallery, onto which open the dormitory and recreation room on the second floor. A locker room and lavatory occupy the rear of the second floor. On the third floor, combining in one group with the tower of the building, are living room, bathroom, kitchen and dining alcove. These are intended for the use of the fire lieutenant in charge

First Floor

Second Floor

COST AND CONSTRUCTION DATA

Fire House, Palm Beach

Clark J. Lawrence, Architect

YEAR OF COMPLETION: 1927.

GENERAL TYPE OF CONSTRUCTION: Semi-fireproof.

EXTERIOR MATERIALS: Stucco.

ROOF: Spanish tile.

APPROXIMATE CUBIC FOOTAGE: 95,000.

COMPLETED COST PER CUBIC FOOT: 50 cents.

TOTAL COST: $40,000.

of this station, as the main dining room for the firemen, together with a large kitchen and pantry, and the operator's and chief's offices are located in a one-story wing adjoining the apparatus room. The informal plan of the building gives an opportunity for an exterior more picturesque and attractive than is usually possible in the design of a fire house. The structure as a whole composes well and convinces one of the appropriateness and desirability of using so definite a style as the Spanish for the design of a purely utilitarian and municipal building in a Florida town. The tinted stucco walls, the Spanish tile roof and the stone door trim further add to the distinctive character of the building. The residential character of its appearance is due partly to the spacious overhanging gallery across the front. This aids in taking away the "public building" aspect so common to structures of this nature and helps it to fit pleasantly into its surroundings, which are those of a high class residential district. At the same time, the utility of the layout is not interfered with in any way; the tower which adds so much to the appearance of the exterior is utilized for the drying of hose, and the screened-in porch is greatly appreciated by the firemen as a lounging and sleeping place. The entire effect of the fire house is derived from a study of mass and the building up of an interesting silhouette. There is no elaborate or expensive detail, and yet it is not lacking in interest and charm which tie it well into its setting.

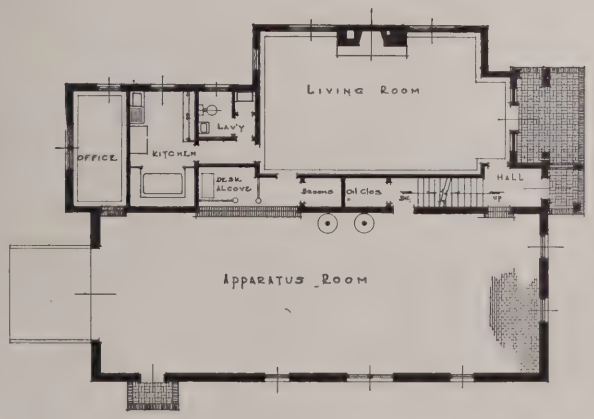
Side Entrance

Fire House, Palm Beach

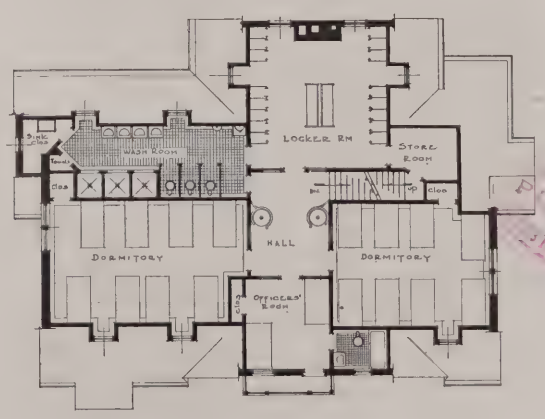
Clark J. Lawrence, Architect

FIRE STATION, WHITE PLAINS, N. Y.
THEODORE RICHARDS, ARCHITECT

THIS two-apparatus fire building may logically be called a fire house. The character of its design distinctly marks it as a house and not as a typical fire station with several large doors and two or three stories of brick walls. The building is not only well designed but is well located at the corner of two streets in a suburban section of the important New York county seat of White Plains. The fact that a fire house is occupied for the greater part of the day as a place of residence makes it additionally appropriate, that the building should be designed as a house and not as a large stable or garage. The several gables, the long, sloping, deeply pitched roof and the tinted stucco walls are all features which add to the domestic quality of the design. The roof is high and its pitch sufficiently steep to permit excellent head room for the two large dormitories, locker room, wash room and officer's bedroom on the sec-



First Floor



Second Floor

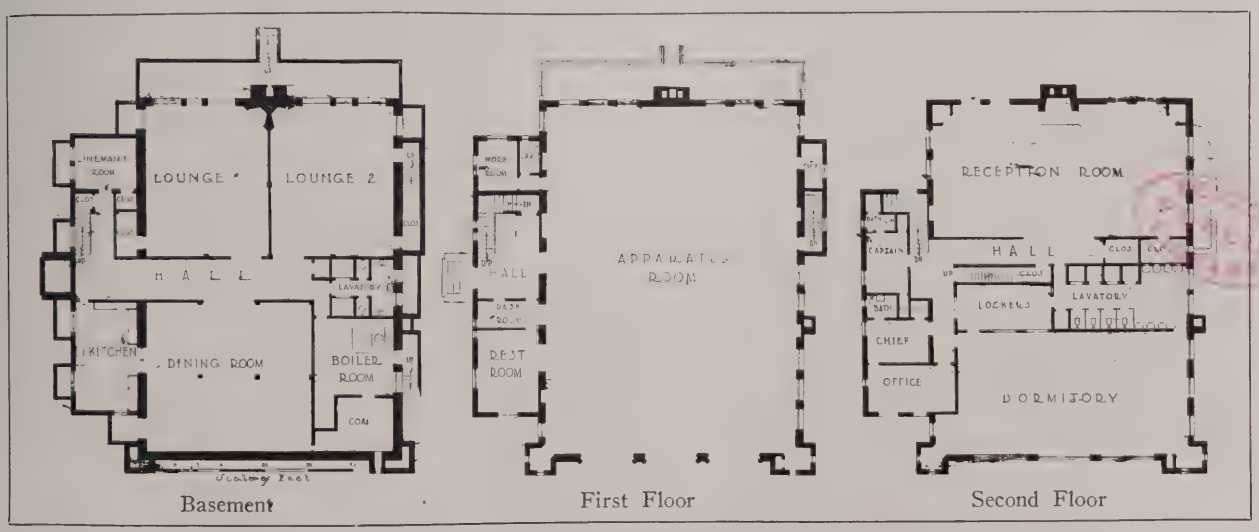
ond floor. The proverbial brass pole as well as a stairway connects this floor with the floor below, where there is located a deep apparatus room sufficiently large to take two pieces of apparatus, one behind the other. Parallel with this long, deep room is an office for the fire captain or lieutenant, and a large living room, kitchen and lavatory. As no separate dining room is provided, it is evident that the living room is used also for dining.

Compared with the typical fire engine house of 25 and 30 years ago, the design and plan of this building mark a great step in advance. The building is convenient, spacious and sensibly planned. Rooms for all of the various requirements of the fire fighters' residence are here, provided in suitable locations. The architect has succeeded in obtaining not only a home-like but a picturesque quality in this design. In comparison with some of the uninteresting neighboring small houses, it is indeed in pleasing contrast. As no tower is provided in this building,—a tower in which long lengths of hose may be hung up for drying after use,—this design is suitable for a fire house where only a motor chemical wagon and hook and ladder are stationed, which is often the case.

Fire Station, White Plains, N. Y.
Theodore Richards, Architect

FIRE DEPARTMENT HEADQUARTERS, WHITE PLAINS, N. Y.
RANDELL HENDERSON, ARCHITECT

HERE is a design for a fire department building following more closely the style of design in favor 30 years ago. In general mass the design is good. The emphasis laid on the three large entrance doors is well carried out by the tall arches, in the lower parts of which these deep openings are located. The rather thin towers or bays at either corner at the front of the building, one of which has a castellated top reminiscent of the wooden Gothic architecture of the Victorian period, do not add to the dignity of an otherwise satisfactory design. In fact these corner towers give to the building a suggestion of the type of design frequently used for state armory buildings several decades ago. The structure would have been simpler and more dignified, and greater emphasis would have been placed on the triple arches which form the principal motif of the entrance elevation of the building, had these corner towers been entirely omitted. The use of Spanish tile in preference to slate or a flat tile also seems in-



Basement First Floor Second Floor

COST AND CONSTRUCTION DATA

Fire Department Headquarters, White Plains, N. Y.

Randell Henderson, Architect

DATE OF COMPLETION: August, 1927.

GENERAL TYPE OF CONSTRUCTION: Entirely fireproof.

EXTERIOR MATERIALS: Black face brick; terra cotta trimmings.

ROOF: Spanish tile.

FLOORS: Composition; apparatus room, brick.

HEATING: Vapor system.

INTERIOR WOODWORK: Birch veneer doors; no wood trim.

INTERIOR WALL FINISH: Public halls and bathrooms tiled; apparatus room, glazed brick; remainder, ornamental plaster.

INTERIOR DECORATIVE TREATMENT: Ornamental plaster glazed. All fireplaces of tile.

APPROXIMATE CUBIC FOOTAGE: 396,800.

TOTAL COST: $150,000.

consistent with the style and character of the building. The general proportions and the plan of the building are good. The apparatus room is sufficiently large to take four pieces of fire apparatus. Office, rest and work rooms are located in a wing at one side of this apparatus room. The fact that this latter room is only one story high gives a tremendous amount of floor space above. Although the building does not seem to be located sufficiently high above grade to permit of a well lighted basement, the principal living quarters for the firemen resident in this building, such as the two large lounges with corner fireplaces, a large dining room and kitchen, are located in the basement, where the windows are lighted by means of large areas. Such an arrangement is, of course, an economy in the cost of the building, as otherwise it would have been necessary to place these principal living rooms on the third floor, as it is always essential that dormitories and sleeping quarters of the firemen shall be not more than one story above the apparatus room and always connected by the typical brass fire pole, down which the firemen slide in their speedy preparation to get out the apparatus and be off in answer to the insistent call of fire.

Fire Department Headquarters, White Plains, N. Y.

Randell Henderson, Architect

FIRE HOUSE, WESTON, MASS.
ALEXANDER S. JENNEY, ARCHITECT

THIS is a good example of the use of the Colonial style of architecture for a semi-monumental public building. As has already been said in connection with one of the other fire houses shown in this group, it is consistent and logical to give a somewhat domestic quality to buildings designed for this purpose. The town of Weston, Mass., contains many fine old examples of Colonial architecture. So the architect in designing this fire house showed good judgment in the selection of style. The well proportioned dormer windows and the gambrel roof with large end chimneys are characteristic of the style. The use of exterior stone capped piers at each corner of the main building is an interesting variation which undoubtedly serves some structural purpose. The steep drop in the grade of the lot on which the building stands makes it possible to have a high basement and small garage under the building at the rear, where special interest is added to the elevation by the introduction of a well proportioned, low, square tower surmounted by a balustrade and cupola reminiscent of Colonial work in Newburyport and Portsmouth. As the cupola is enclosed, there seems to be no provision for an outside fire bell on this building. Whether the pipe projecting from the roof of this cupola is used as a fire whistle or for ventilation purposes, cannot be determined.

Three large doors on the front emphasize the building's purpose. At the right of these doors is a platform supported by concrete retaining walls onto which opens a side door leading out of the large apparatus room, which apparently occupies the entire first floor. From the number of windows on the second story it is obvious that the dormitory and living rooms are located there. From the location of three second-story windows at the west end of the building it would seem that the chimney which rises directly above the middle window must be broken around it and carried down grade in two sections; or else this is a dummy chimney put up to balance that at the opposite end of the roof. The brickwork of the entire building shows unusual care in laying, and the use of recessed brick arches at the three large entrance doors, gives a suggestion of English rather than American design. This is also true of the main cornice of the building, which is entirely carried out in brick. The only wooden trim on the building requiring occasional attention in the way of repairs and painting is the cupola, and the trim on the dormer windows and under the roof's overhang.

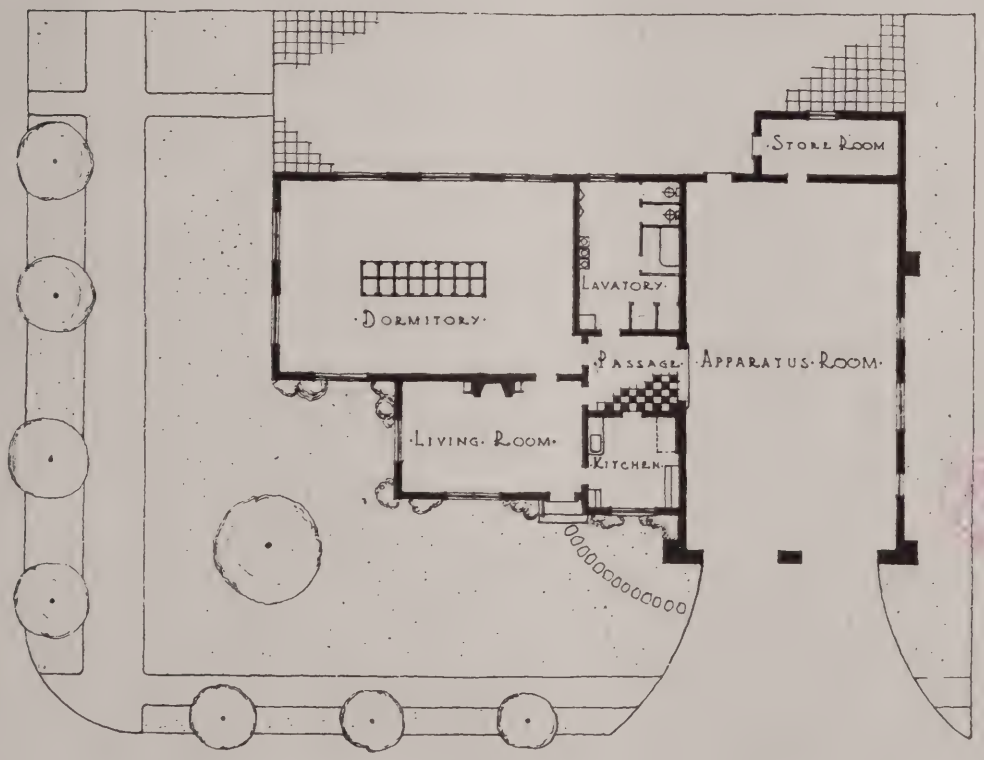
This is a successful piece of architectural design. The elevations clearly indicate the character and purpose of the building. Although a definite style of architecture has been used as the inspiration for the design, there has been a certain amount of freedom shown in the handling of the style.

FIRE HOUSE, WESTON, MASS.
ALEXANDER S. JENNEY, ARCHITECT

Photo. McCurry

FIRE HOUSE, SACRAMENTO
DEAN & DEAN, ARCHITECTS

HERE is another interesting example of the use of the "Mediterranean" type of architecture for the design of a fire house. The character and plan of the building are plainly indicated in the exterior elevation. The main apparatus room is made the chief element of the design, with its two large arched doorways and low tiled roof, which give the effect of an old farm barn in southern Italy. The design of the chimneys, and the low, one-story rooms which abut the higher dormitory wing of the building are suggestive of the sunny South. The plan is simple and compact. The large, deep apparatus room is of sufficient size for two pieces of fire apparatus. A paved passage leads from this room into the living portion of the building, where there are a dormitory, lavatory, living room and kitchen.

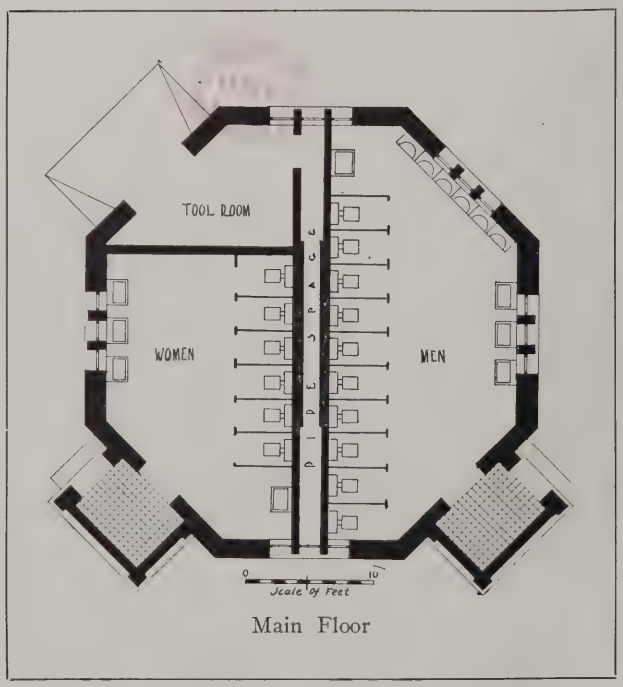


Main Floor

Photos. M. W. Reeves

COMFORT STATION, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT

THIS building is designed in the style known as "Lombard Romanesque," which is one of the most interesting in Italian architecture. Although one of the lesser important types of municipal buildings, the excellence of this design proves that even such buildings as comfort stations can be made to have architectural interest and merit. Characteristic of the style, most of the detail, such as the main cornice and frieze, some of the wall panels and the base course, is carried out in brick. In this type of design it is thoroughly consistent and appropriate, as well as pleasing to the eye, to use the typical corrugated Spanish tile. Any type of flat tile would have made the building much less interesting and consistent. The octagonal plan is simple, well balanced and direct. A narrow passageway, in which all of the pipes from the various toilets are located, extends through the center of the building. This pipe passage is accessible from the small tool room at the rear. On one side of this passage is the men's room, and on the other the women's room. These rooms are reached from separate entrances, each of which has a small vestibule, as seen in the accompanying illustration. Some sort of vestibule or entryway is always essential in the plan of a comfort station. Frequently these vestibules are placed inside instead of outside the building. In this case there was no room on the inside, so the architect very wisely designed small exterior vestibules, which add to rather than detract from the exterior interest of the station.



Main Floor

Men's Entrance

INTERIOR ARCHITECTURE

DETAILS FROM THE FRENCH CHATEAUX

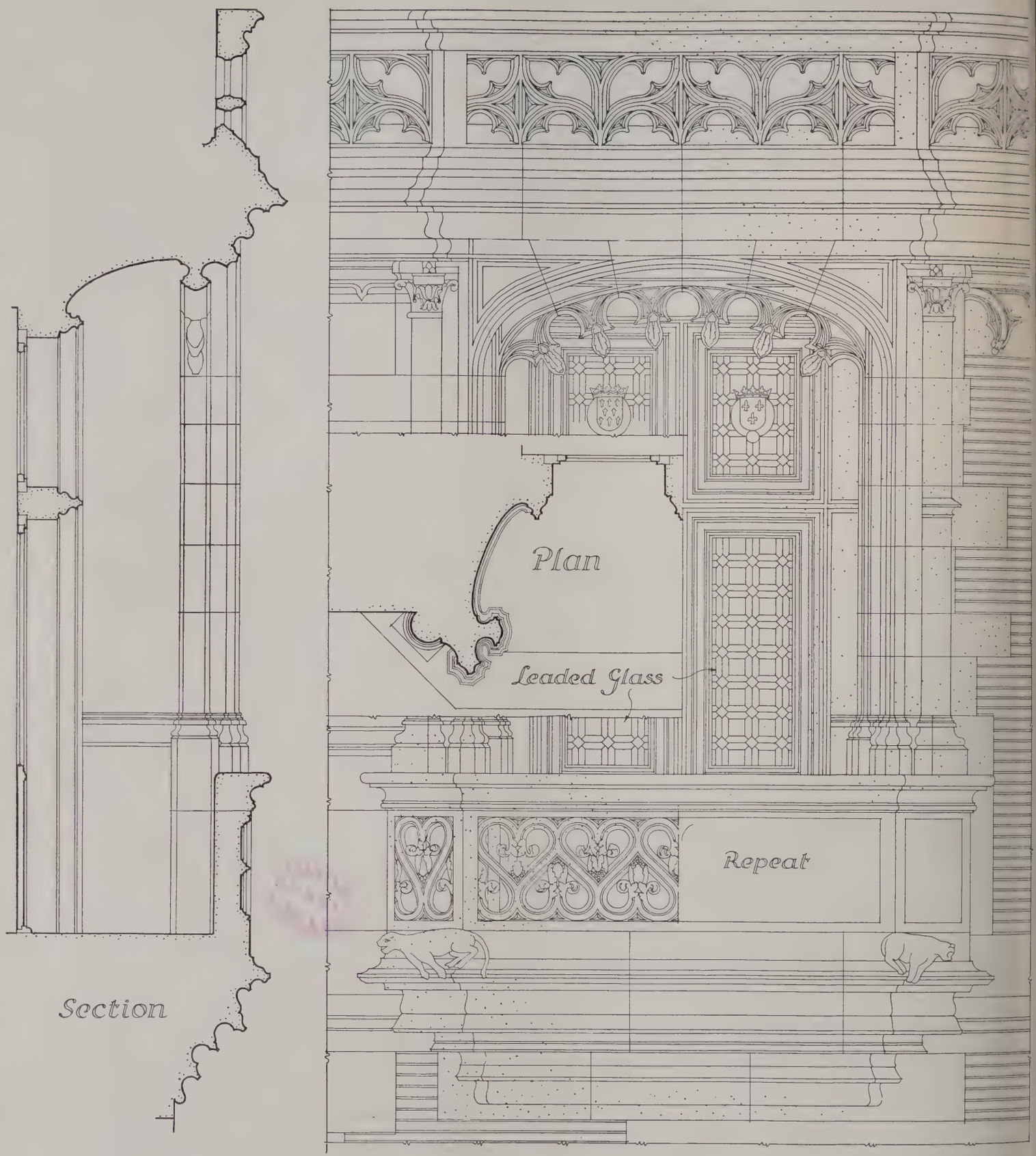
TEXT AND MEASURED DRAWINGS BY
ALBERT A. CHADWICK

THE Louis XII wing at Blois is one of the few great buildings in France in which brick and stone are combined. The beautiful mellow red of its brickwork is a relief after the monotony of drab stone. At Blois we find motifs from the Louis XII wing, which is almost purely Gothic, constantly repeated in a modified form in the Renaissance wing of Francis I. This is not surprising, since there was practically no break in time between the completion of one wing and the beginning of the other, and it is also true that the same men carried on the work. The two balconies on the entrance front of the Louis XII wing with their fleur-de-lis ornamentation are very beautiful and unusual. They serve to give balance to a facade which would otherwise be rather uninteresting. The balconies on the north front, although they are flush with the face of the building and although their detail is entirely different, were evidently inspired by the two balconies on the entrance facade. However, this north front is not as pleasing in its design as is that of the wing of Louis XII, because the balconies are here rather monotonously repeated, detracting from their interest.

Many of the Renaissance cornices in France show that their inspiration was derived from the unique cornices at Blois. The cornice of the stair tower

Detail of Balcony on Back

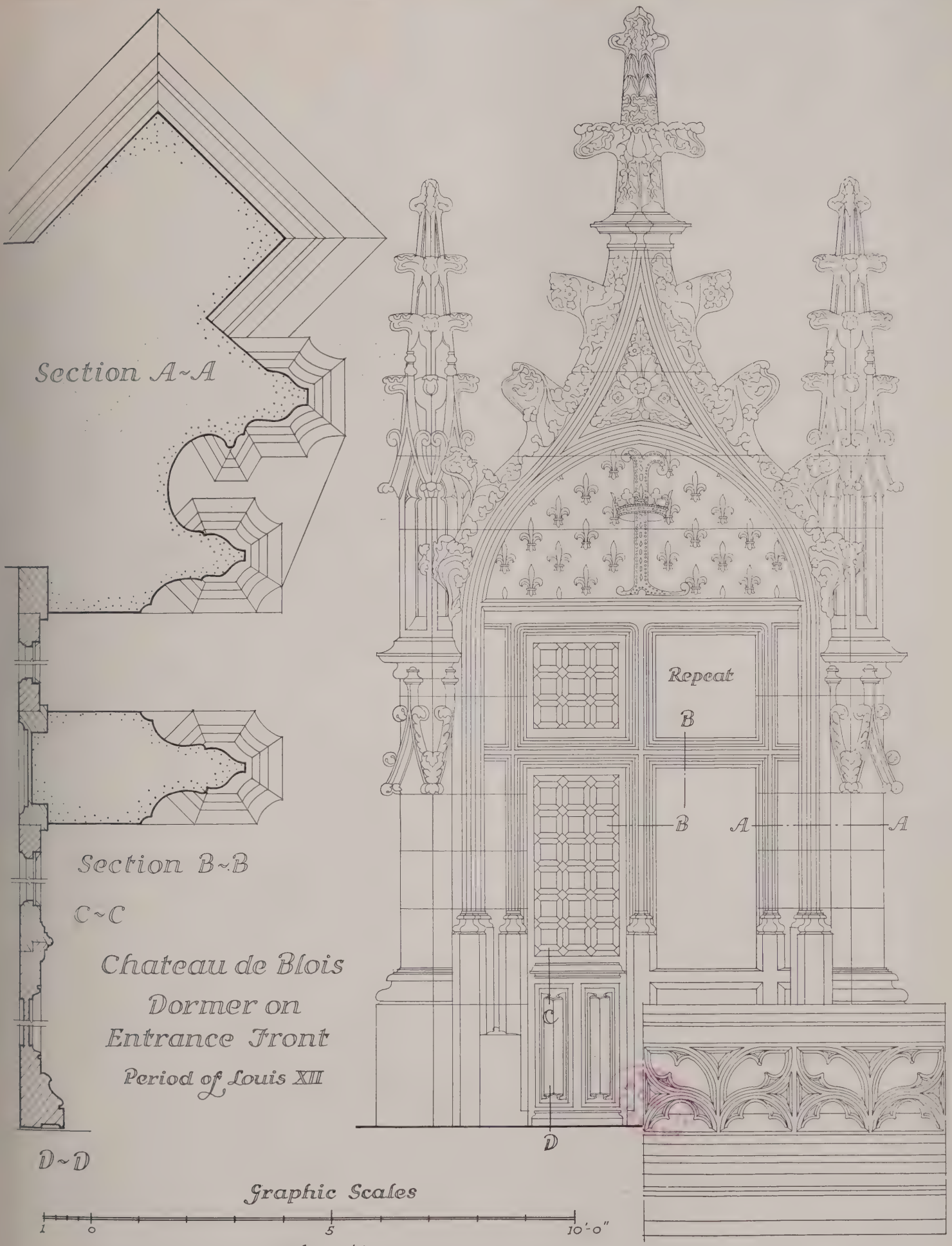
Entrance Front, Chateau de Blois

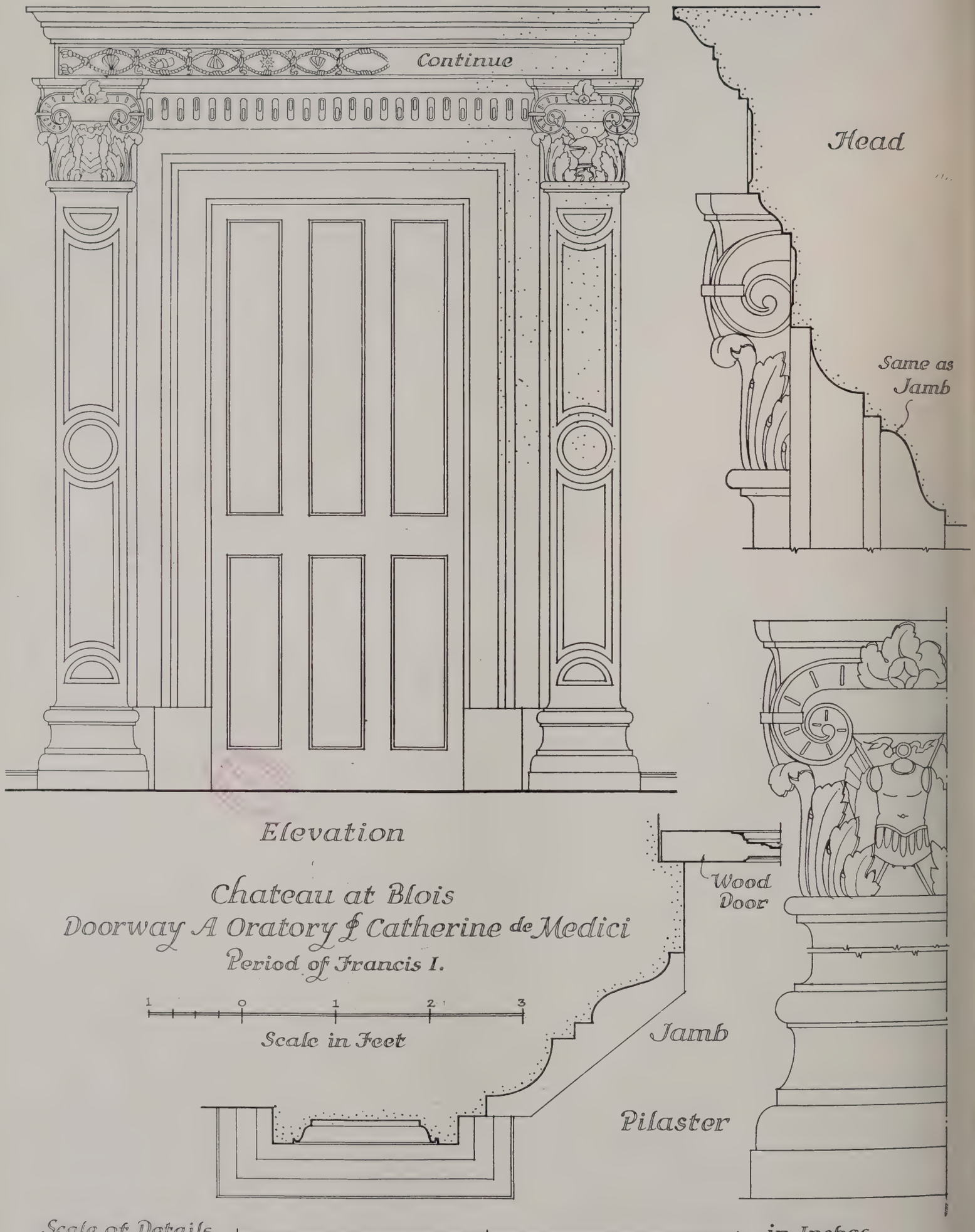


Balcony on Entrance Front Chateau de Blois

Period of Francis XII

Scale 1 0 5 10 in Feet


Section A~A
Section B~B
C~C
D~D
Repeat
B
B
A
A
C
D
Chateau de Blois
Dormer on
Entrance Front
Period of Louis XIII
Graphic Scales
1
0
5
10'-0"
Elevation
1'-0"
0
3
6
9
12"
Details
Elevation



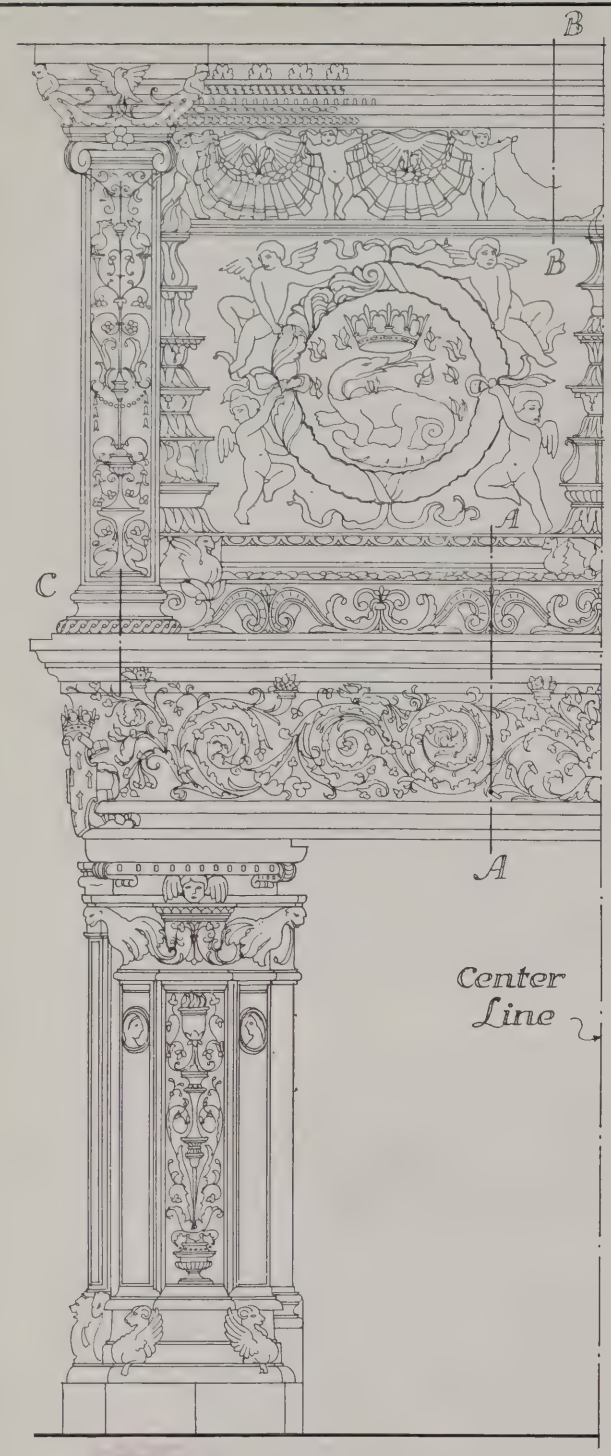
Elevation

Chateau at Blois
Doorway A Oratory f Catherine de Medici
Period of Francis I.

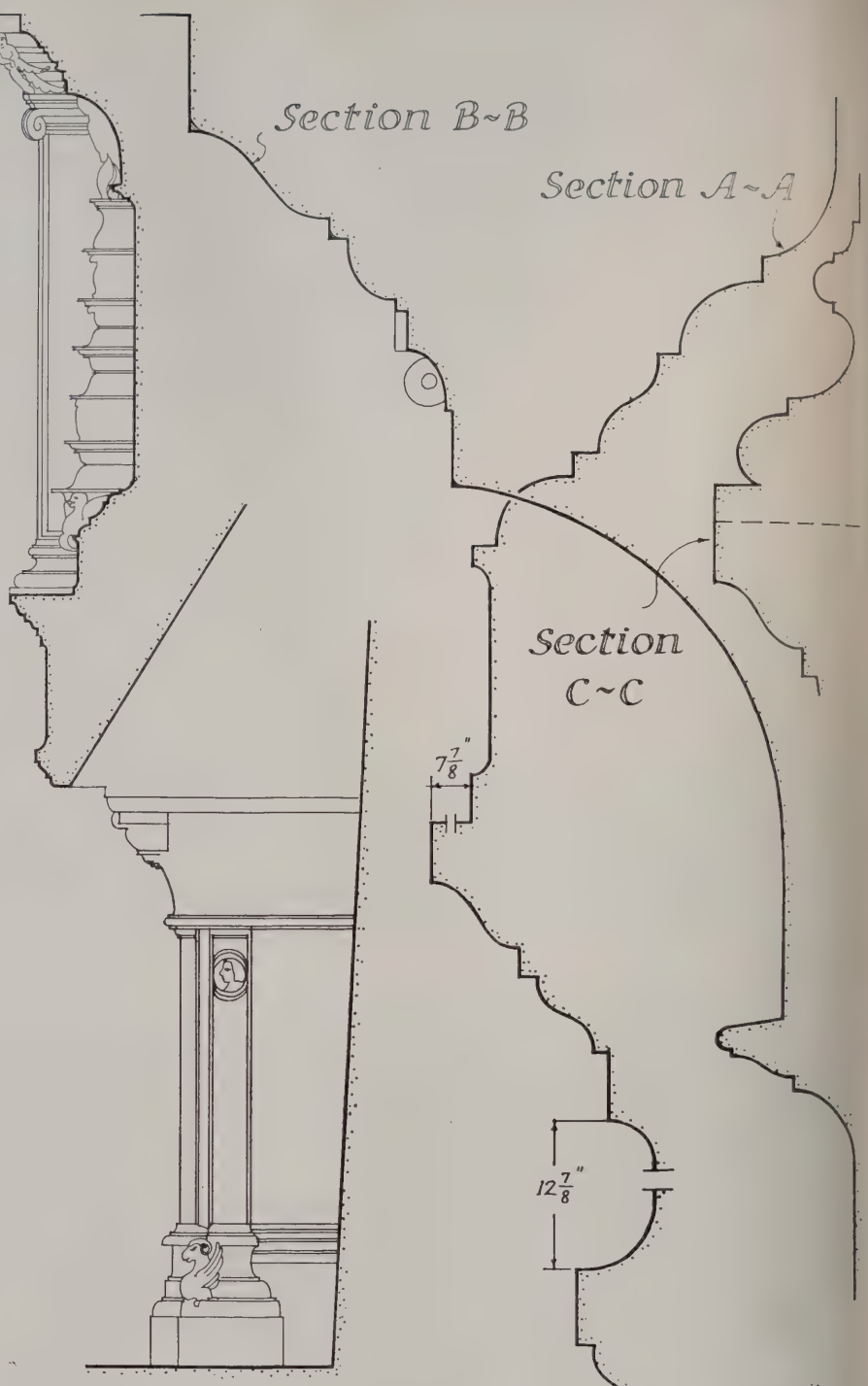
Chateau de Chenonceaux

in the Louis XII wing served especially as a prototype to be copied and repeated again and again. The cornice under the balcony in the court at Chaumont seems to represent the intermediate phase, while the cornice of the Francis I wing at Blois is the ultimate achievement. At Chenonceaux we find a regular entablature with architrave, frieze and cornice; but here ends any adherence to Italian precedent. The architrave has rather clumsy Gothic pendants located under the balusters of the frieze, while in the frieze itself is repeated the balustrade design of the lower balconies. The cornice, which has modillions with Gothic rosettes between them, was built at the same time as the Francis I wing of Blois, but the cornice of the latter was very much influenced by the earlier Louis XII, wing while that at Chenonceaux suggests much more the Italian precedent. The character of the work is cruder than that at Blois and nowhere nearly as effective. The chimneypiece in the *Chambre de Salle de Gardes,* which is one of the most beautiful of all the Renaissance fireplaces in France, was inspired by a chimney in the Louis XII wing. It is almost pure Gothic, and unusually rich and refined in ornament. The frieze below the shelf, with its foliated scroll, is especially beautiful. One cannot but marvel at the delicacy of carving and the beauty of line achieved by these old workmen, especially when one notes their lack of precision, which perhaps adds much to their charm and character.

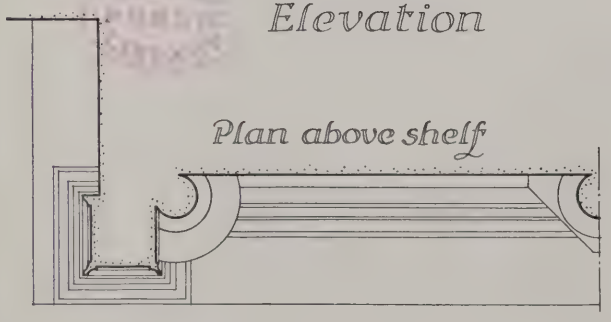
Chimneypiece, Chateau de Blois



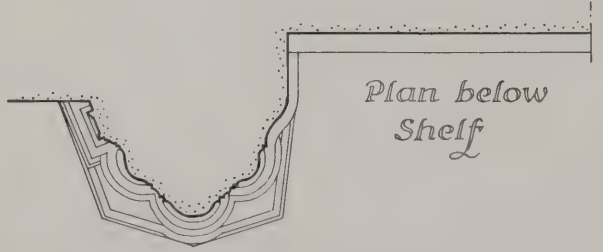
Elevation



Section



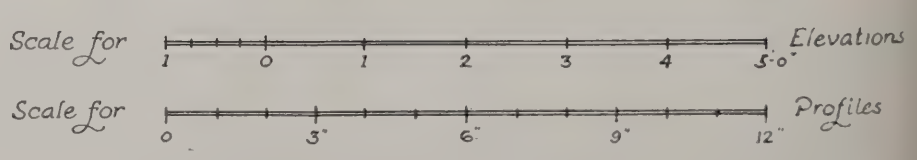
Plan above shelf

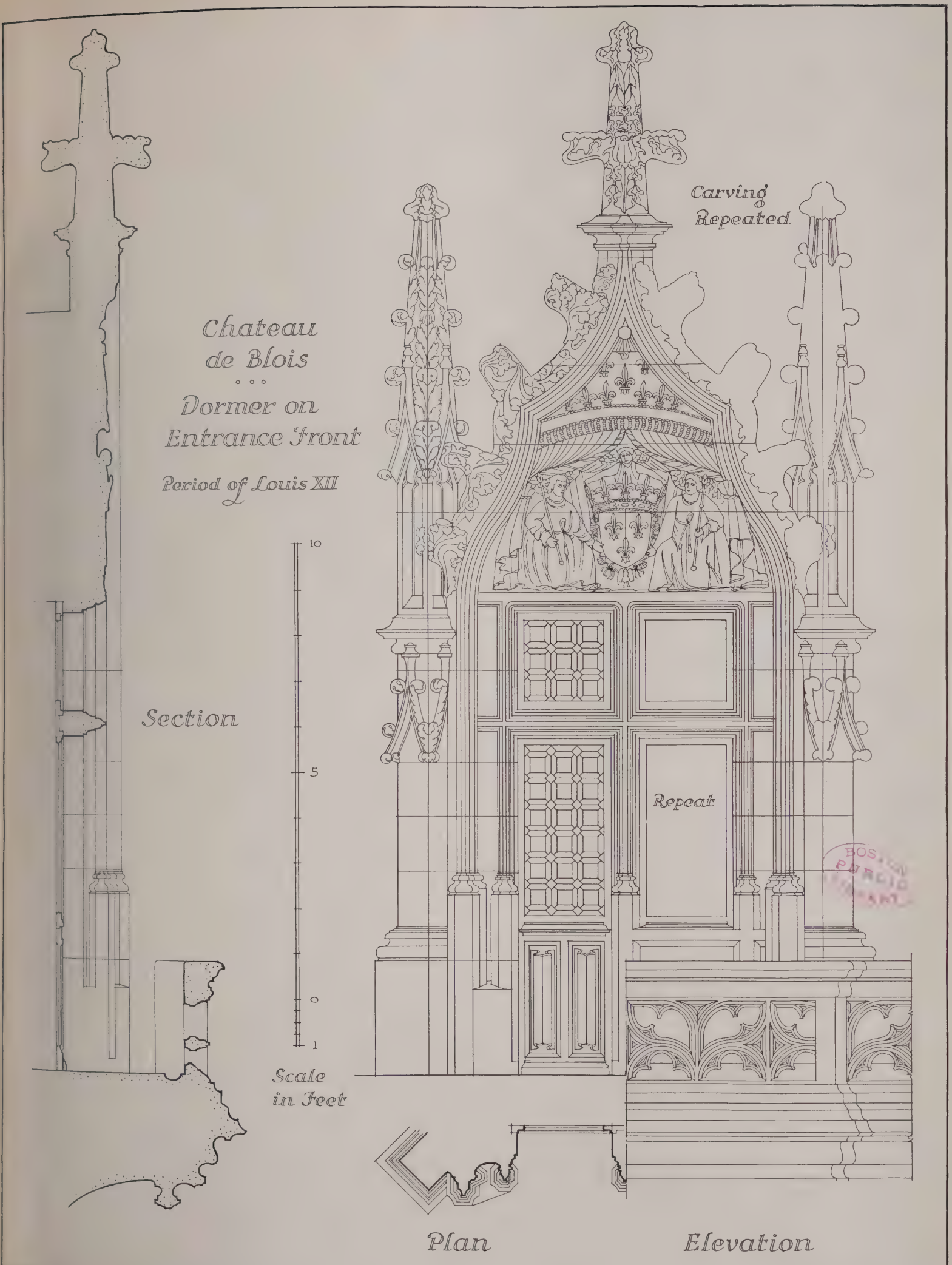


Plan below Shelf

Chimney Piece in the Chambre de la Salle des Gardes Chateau de Blois

Period of Francis I





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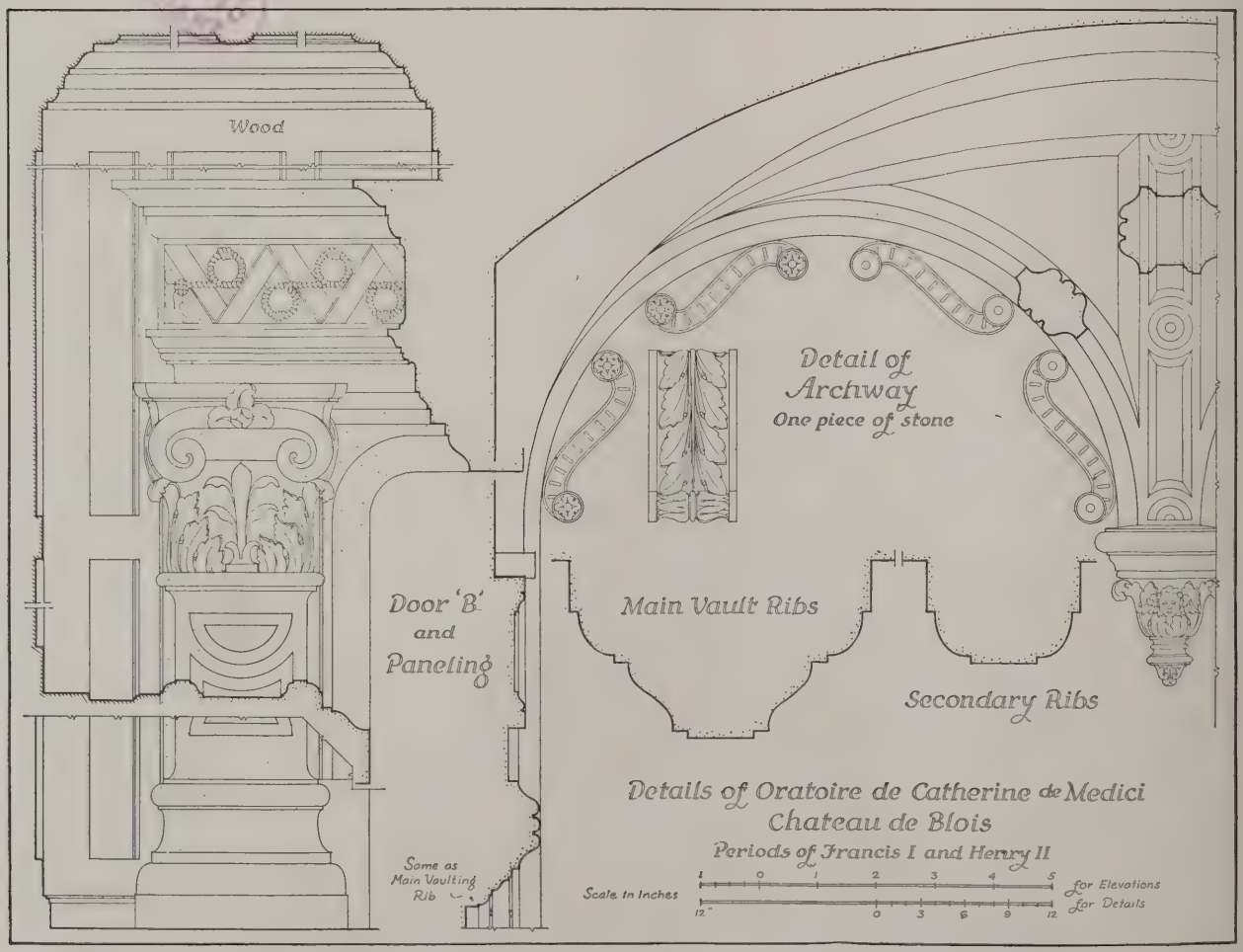
Oratory of Catherine de Medici, Chateau de Blois



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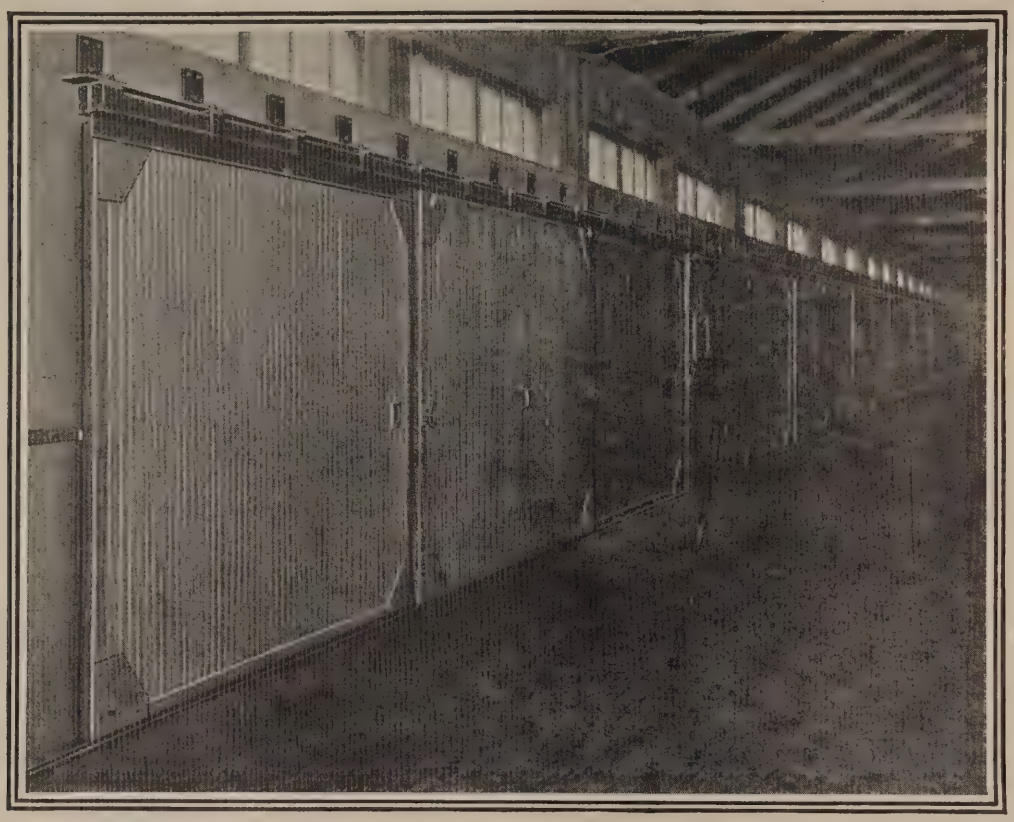

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BOOK DEPARTMENT

"ESTIMATING BUILDING COSTS"

Reviewed by CLIFFORD WAYNE SPENCER

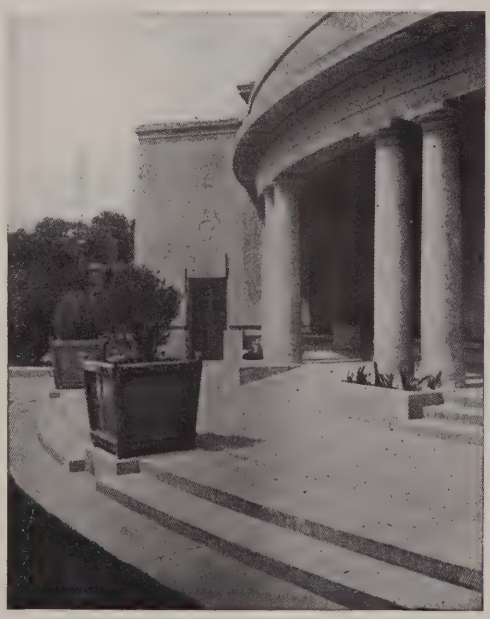
IN this age of commercialism, the question of cost has come to be of prime importance in the business of building, and in no case can it be treated lightly. In addition to being an artist and designer, the architect must now be a cost expert and be able to make a fairly accurate estimate of the cost of the building for which he makes the plans. In fact a very large proportion of modern building is planned on the budget system, which means that it is absolutely essential for the architect to know labor and material costs in order that he may give his client the best possible building and still keep within the limits of the original appropriation. It is probably true that in no other respect is the architectural profession open to so much well deserved criticism as on the question of false or inaccurate estimates. Certainly it is easily understood that if a client has been told by his architect that his house will cost $10,000 and then finds, as is so often the case, that it is to cost $15,000, he will lose confidence in his own architect and much descredit will be cast on the profession in general. No doubt there are some cases where misleading estimates are deliberately given by unscrupulous practitioners for the purpose of encouraging clients to go ahead with building, but the general high standard of ethics in the profession makes such cases few and far between, and in the vast majority of instances, such estimates are the result of insufficient preparation or lack of thought on the part of architects.

Of course, a really thorough and complete knowledge of estimating may well require a lifetime of study, research and actual experience, and certainly no one can hope by the mere use of books and printed formulæ to arrive at the solution of a problem in which so much depends on local and rapidly changing conditions. Yet a great deal of preparatory knowledge can be gained from a careful study of the printed results of the experiences and researches of others which, when checked against one's own experience and adapted to circumstances of time and place, will furnish a satisfactory groundwork on which to proceed. The use of the more ponderous collections of data and tabulated information is often discouraged by their very vastness and completeness, and a beginner will be overawed by the great amount of information and the vast variety of different conditions to be complied with. According to a certain great teacher of language, it is better to use "a small grammar, when learning a language, than a big one." And the same is true when learning to estimate or when a person wishes to get a good general knowledge of building costs with-

Architectural Design in Concrete

By T. P. Bennett, F. R. I. B. A.

THE great utility of concrete as a material for building lends importance to any work which deals with its use. Already centuries old, with its splendid durability and permanence amply demonstrated by structures of many kinds which have already been used for ages, concrete is one of the most valuable of all the substances used in building and engineering of every kind. Its very adaptability and workability give it a value possessed by few if any building materials, and its value is often enormously increased by the use with concrete of steel reinforcing which adds a strength which it never possessed before. "Reinforced concrete has earned its front rank position among materials for permanent construction because of its intrinsic merits. Its fireproofness protects life and property; its strength and safety are increased by its monolithic nature; and its permanence is proved by long use."



THE text of this work dwells in detail upon the working of concrete; details of construction; continuous vertical support; verticality; monolithic concrete; concrete vaulting; textures; "crazing"; and treatments; and other subjects of importance to the architect, engineer or builder concerned with concrete. It sums up and presents the experience of many successful workers in concrete construction. The volume deals with concrete and with its design as influenced or governed by its construction. Its authors have been fortunate in selecting admirable examples of the use of the material, and the work contains, among a large number of illustrations, views of residences, tall structures such as hotels, theaters, power houses, or office buildings; bridges, aqueducts, retaining walls and walls of other kinds. The views are of work in more than one country, for there are illustrations of buildings in England, France, Belgium and Germany, as well as many of structures in the United States

Text and 100 Plates; 8½ x 11 ins. Price $10

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out spending the time to go through a mass of detail, much of which would probably have no bearing whatever on the particular work he is doing; and even in the case of one who is able to go more deeply into the subject, such a small volume will furnish a good preliminary training to enable him to make better use of the larger and more complete technical works, which are many.

An excellent little book for such preparation and for use in estimating costs of smaller buildings, such as dwellings, barns, stores and industrial structures of moderate cost, has been written by William Arthur and is called "Estimating Building Costs." It is now in its third edition. It is written as compactly as possible, in simple and direct terms so as not to be confusing even to the most elementary student. The material covers all the different steps of building construction from excavation to painting, and each important class of building material is treated in a separate chapter. There are 91 tables showing the number of hours needed and amounts of work done. As the price of labor varies greatly with locality and season, all labor costs are shown at the rate of $1 per hour for mechanics and 60 cents per hour for laborers, so that they may be readily translated into terms of the prevailing local wage rates. In addition to being a reliable guide for use in estimating, the book contains many bits of useful information, and it even includes a chapter entitled "Hints on Drawing," which is no doubt rather elementary to be of much interest to the average architect but which will be very instructive to the beginner or those builders who are not familiar with architectural customs and practices. It discusses such things as plan indication, architects' charges, and general information on the preparation and printing of plans. In the following chapter, however, there is considerable useful information on building methods and materials which may be of interest and use to the architect as well as to the builder. A list of the chapters will give an idea of the completeness of the work and includes, in addition to the two on drawing and building hints already mentioned, chapters dealing with—Excavation and Piling, Concrete, Brickwork, Stonework, Plastering, Woodwork, Millwork and Glass, Solid and Sheet Metal, Roofing, Painting, Plumbing and Heating, and Miscellaneous Subjects. The treatment under each of these headings is very complete and is made especially effective by the fact that in all cases several easily understood examples are given illustrating the various processes and showing how they are applied to actual building problems. The reviews at the end of each chapter are in the form of questions and will be very useful where the book is used as a text book, especially since the answers to these questions are given in the key at the back of the volume. By the use of these questions and answers it will be possible to condense the study of the most important points in a very effective manner. In looking through the pages of this volume one finds that it is much more than a collection of tables for estimating and is really a very practical guide for the construction of small buildings; and that it contains a great deal of information useful to the specification writer as well as the estimator, and certainly to contractor or builder or to anyone interested in construction.

ESTIMATING BUILDING COSTS. By William Arthur. Third Revised and Enlarged Edition, 233 pp., 4½ x 7 ins. Price $2. Scientific Book Corporation, 15 East 26th Street, New York.

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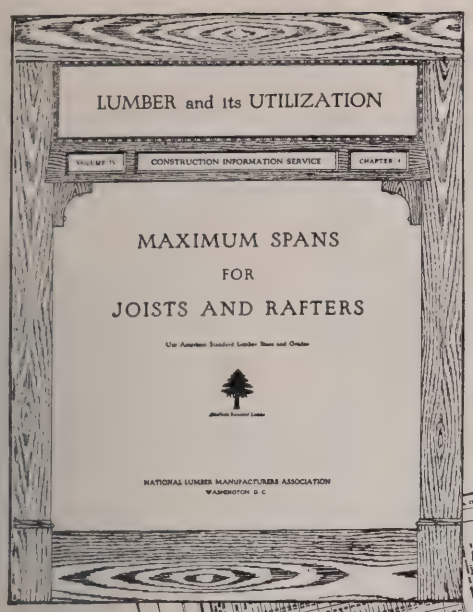

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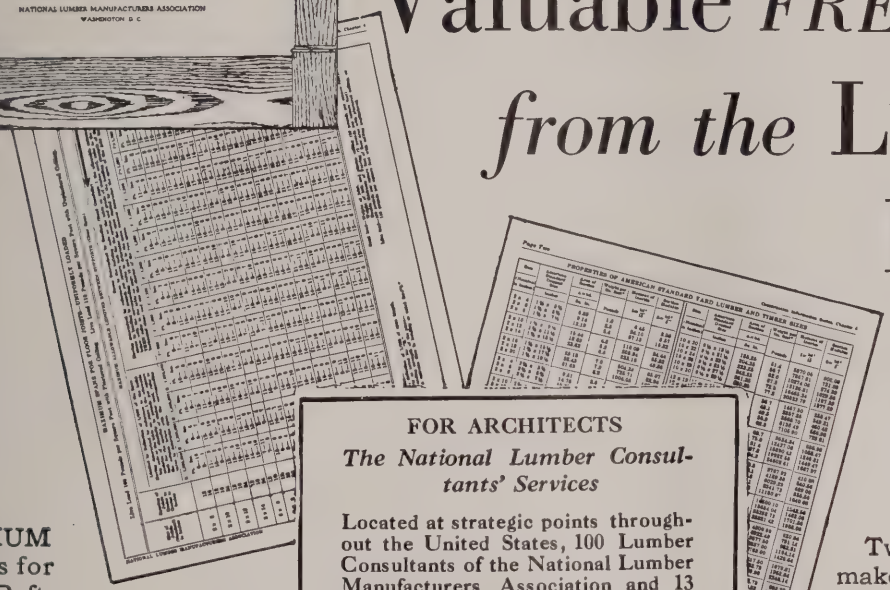

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STAIR BUILDER'S GUIDE. By Morris Williams. New Edition. 259 pp., 5¾ x 8½ inches. 358 illustrations. Price $3. Scientific Book Corporation, 15 East 26th Street, New York.

ONE of the most prominent features of almost any building is the stairway. It is seen by everyone; its convenience and beauty are readily appreciated, and its faults and defects instantly detected. Its construction is considered the highest branch of joinery, and far more care and knowledge are required in its planning and execution than in any other part of the building. By the design of the staircase there may be achieved an appearance of grandeur that will characterize the whole interior of a building. The prime utilitarian object in designing stairways is to secure ready access to the upper stories, and they should be planned to give ample head room and facilitate travel from one story to another, while at the same time care should be taken to assemble the various members in a harmonious fashion so that the finished structure will present an appearance that is as beautiful and pleasing as its prominence warrants.

When one looks at a graceful flight of stairs circling and spiraling upwards, it is easy to realize that their construction has been no simple matter, and indeed it is true that the science of stair building has its fundamentals in the solution of the most intricate problems of plain and solid geometry. Some of these have been solved by mathematicians and have resulted in systems of cylindrical handrailing. The foremost exponent of this science was Peter Nicholson, and nearly all work along this line since his time has been merely an attempt to simplify the results of his investigations. These attempts have been so successful that it is said that the art is virtually perfect and that further improvement cannot be expected. The number of mechanics who are thoroughly competent to lay out and erect a set of complicated stairs is relatively small, and it is desirable that the individual who designs and supervises the construction of such stairs have a thorough knowledge of the problems and principles involved in their erection. It is said that the chimneypiece is the central motif of a well designed room, and that its design governs the room's scale and treatment, but it is no doubt true that the stairway furnishes the central motif for the entire interior treatment of the building. Being such an important part of the structure, great care should be taken that the design and construction afford the maximum of safety, convenience and æsthetic appeal. In a matter of such importance too much cannot be left to the mechanics, and stairways should always be carefully detailed and their construction supervised by an inspector who is familiar with the principles of scientific stair building.

In the "Stair Builders Guide," by Morris Williams, all the up-to-date information on this important science is presented in short and carefully prepared chapters. The layout of each working detail is carefully considered, explained and illustrated. Plans of many stairways are shown as they are often designed, contrary to all standard and prescribed rules of correct construction, but these defects are pointed out and the correct plans are considered. The author confidently asserts that all those engaged in the building trades will find that this book gives the requisite instructions for becoming proficient in the art of making hand-railing. The book is now in its third edition, and it is considered a standard reference work.

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STEEL AND TIMBER STRUCTURES. By G. A. Hool and W. S. Kinne, 695 pp., 6 x 9 ins. McGraw-Hill Book Co., Inc. Price $6.

THE technical considerations in building are becoming ever more important as the height of structures increases and their design becomes more and more intricate. In the planning of bridges and buildings it is necessary for the architect to coöperate with the engineer and to study the engineering problems involved in their construction. It is not necessary for the architect to go into the problems as deeply or as thoroughly as does the engineer, but he should have an intelligent idea of the principles involved so that he may not only talk intelligently on the subject but may be able to make plans that are plausible and practical from an engineering viewpoint. Several very useful and usable reference and text books on the technical phases of building have been compiled by George A. Hool, S. B., Consulting Engineer and Professor of Structural Engineering at the University of Wisconsin, and W. S. Kinne, B. S., Professor of Structural Engineering at the same institution. This series consists of volumes on: Foundations, Abutments and Footings; Structural Members and Connections; Stresses in Framed Structures; Steel and Timber Structures; Reinforced Concrete and Masonry Structures; and Movable and Long-Span Steel Bridges.

The volume on Steel and Timber Structures, which is the subject of the present review, is compiled by a staff of experts who act as associate editors. This staff includes such men as O. A. Bailey, Chief Engineer, Chicago Bridge and Iron Works; W. C. Buetow, State Bridge Engineer, Wisconsin; C. W. Chase, Drawing Room Engineer, American Bridge Co.; Charles D. Conklin, Jr., Civil and Structural Engineer, Cheltenham, Pa.; F. W. Dean of Wheelock, Dean & Bogue, Inc.; F. W. Dencer, Engineer, American Bridge Co.; Henry D. Dewell, Civil Engineer, San Francisco; Phil A. Franklin, Structural Engineer, McClintic Marshall Co.; T. W. Golding, Consulting Structural Engineer, New York; James H. Herron, President, James H. Herron Co., Engineers and Chemists, Cleveland; C. K. Kennedy, Drawing Room Engineer, American Bridge Co.; H. E. Pulver, Associate Professor of Structural Engineering, University of Wisconsin; and Hermann von Schrenk, Consulting Timber Engineer. The volume starts with a section on buildings which consists of a discussion of steel office buildings by F. W. Dencer; steel mill buildings by C. W. Chase and C. J. Kennedy; timber framed floors and roofs by Henry D. Dewell; and slow-burning timber mill construction by F. W. Dean. All these types of construction are thoroughly discussed and illustrated by the use of formulæ, tables and diagrams. Section 2 gives a thorough description of roof trusses by W. S. Kinne, under these sub-headings: General Design; Design of Purlins for Sloping Roofs; Detailed Design of a Wooden Roof Truss; Detailed Design of a Steel Roof Truss; Detailed Design of a Truss with Knee-Braces; Arched Roof Trusses; and Ornamental Roof Trusses. Section 3 is divided into two parts, one dealing with steel railway bridges by George A. Hool and W. S. Kinne, and steel highway bridges by W. C. Buetow. Timber bridges and trestles are discussed by Phil A. Franklin in Section 4, and steel tanks by O. A. Bailey in Section 5. The design of chimneys as discussed by H. E. Pulver in Section 6 will be found very useful and highly instructive.

PROVINCIAL HOUSES IN SPAIN

By Arthur Byne & Mildred Stapley

ARCHITECTS value Spanish types of domestic architecture because of their simplicity of design and plan and also because they are easily developed in materials inexpensive and easily had. Spain offers a choice of several kinds of residence architecture, types sufficiently different from one another to afford considerable range of selection, yet all possessing the same strength and virility, the excellent lines, the same graceful but unaffected grouping, and the discriminating use of detail which renders distinguished so many Spanish domestic buildings.

Houses in various parts of the Spanish peninsula, particularly the buildings of medium size in rural districts or provincial towns, offer excellent precedent for use in different parts of America where climate conditions are about what prevail in the provinces of Spain.

IN this volume two well known writers on Spanish architecture and decoration review the various forms which are given to the small or medium sized house in Spain. To render the work as helpful as possible to architects, the authors have included many plans and drawings of different kinds, details of such exterior parts of buildings as friezes, cornices, windows, timber overhangs, soffits and balconies, or of such interior parts of the structure as ceilings, fireplaces, doors and stairways. Part of the work deals with the tiles, pottery, ironwork, plaster in relief and the other forms of craftsmanship which contribute so much to the excellence of domestic architecture in Spain. It is a work likely to be invaluable to the designer.

The book contains text and 190 plates 12½x16 inches, and is bound in cloth. Price $30, postpaid.

ROGERS & MANSON COMPANY, 383 Madison Avenue, New York

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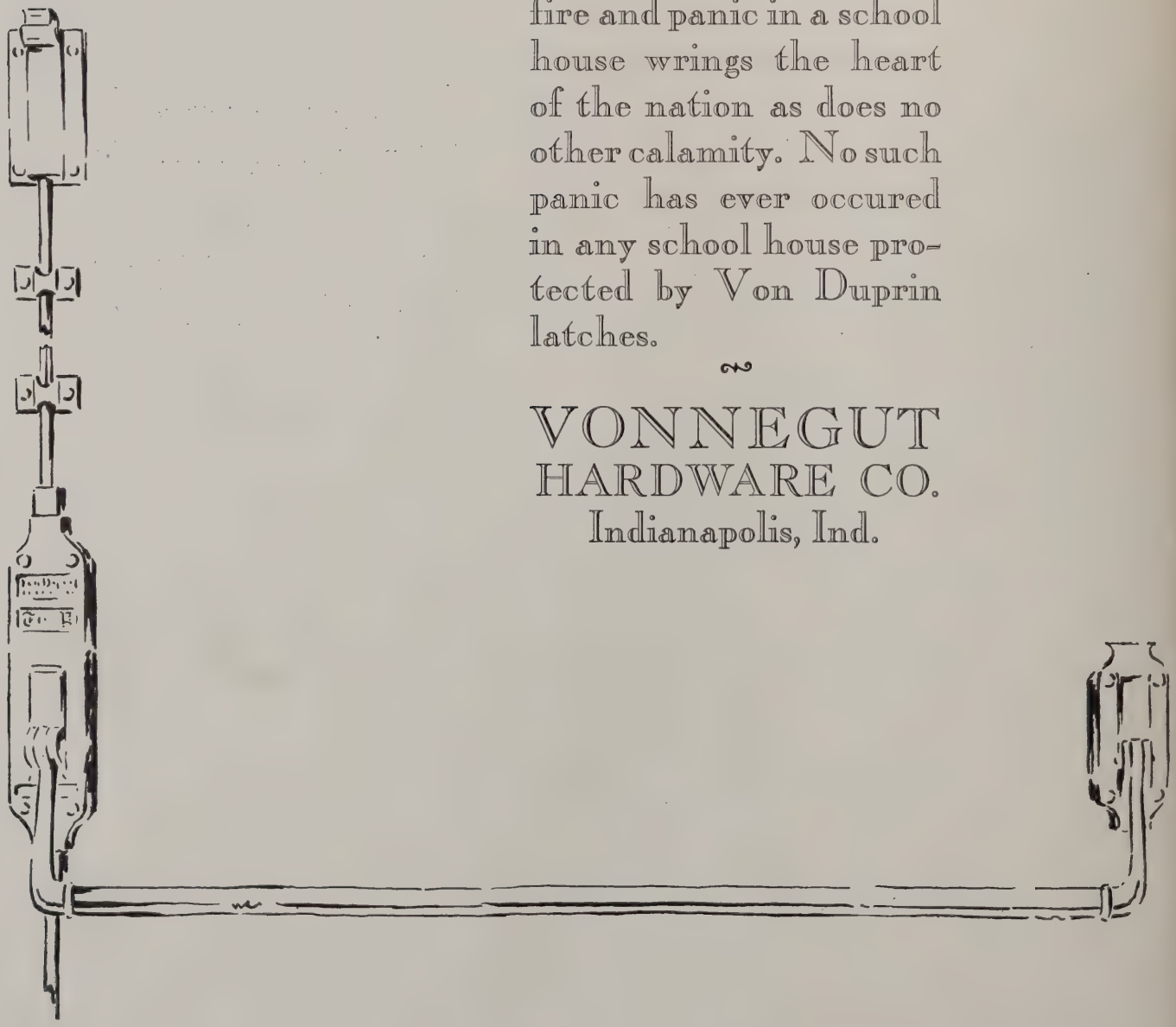
Von Duprin

Self-Releasing Fire Exit Latches

Sweets, Pages B2036-2039

AIA 27c5



The occasional deadly fire and panic in a school house wrings the heart of the nation as does no other calamity. No such panic has ever occured in any school house protected by Von Duprin latches.

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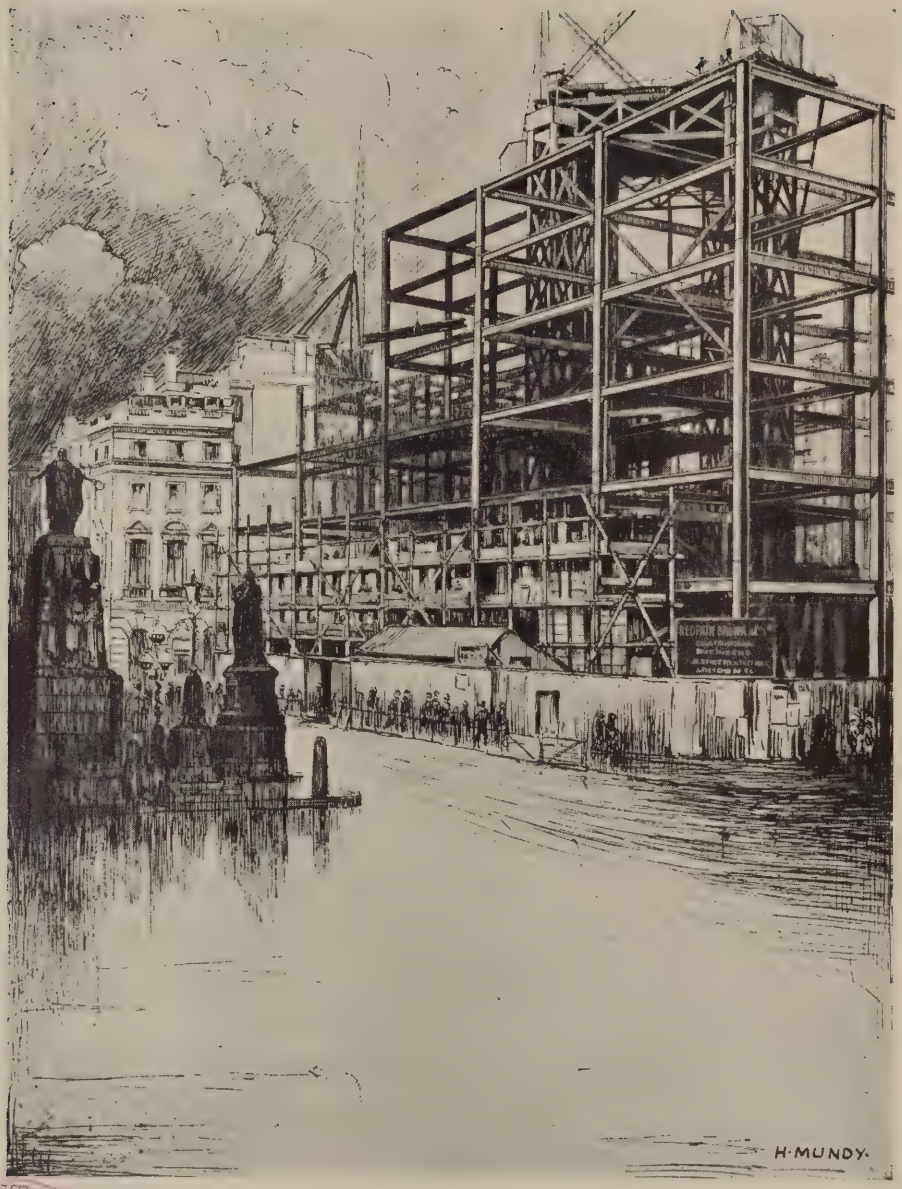

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CONSTRUCTION IN LONDON
From a Pen Drawing by Harold Mundy

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER FOUR

OCTOBER 1928

THE PROTECTION AND MAINTENANCE OF STRUCTURAL STEEL

BY
FRANK W. SKINNER
CONSULTING ENGINEER

UNDER ordinarily careful treatment, with reasonable conditions and requirements, the steel framework of a building can be relied on for strength and safety. At the same time, it conforms most readily to architectural æsthetic and economic requirements, occupies a minimum amount of space, permits maximum dimensions of construction, rapidity of erection, ease of repairs, and demolition or extension in service. Structural steel for architectural purposes must almost of necessity be designed in accordance with accepted rules and standards. It must conform to well perfected types and details, be entirely fabricated by skilled workmen with machine tools in special shops, and erected by experts with special equipment which largely eliminates the probability, and most of the possibility, of bad workmanship, poor materials, mistakes, accidental damage, or departure from intended structural type.

Although within the 40 years since structural steel became commercially available for architectural purposes there have been no failures of buildings caused by the deterioration of the steel framework, the safety and durability of the latter have been unjustly attacked, and some prominence has been given to untrue statements concerning it. Within a few months metropolitan newspapers have been given currency to a wholly unwarranted statement that the structural steel frameworks of tall office buildings and the like have been found seriously damaged in service. It was said that they are likely to be, or soon to be, in a highly dangerous condition; that their life is very short and that they require very frequent and extremely rigid inspection, overhauling and repairing to avoid disaster. Such is far from being the case. The erroneous statements have been fully refuted in the public press and no contradiction has been made to the refutation. The present standard practice produces steel framework of ample strength, accurately proportioned for the required service and with a high degree of perfection in design, materials, and workmanship that, under proper conditions, insures practically unlimited safety and durability. Under ordinary conditions that govern the design and construction of steel buildings, the steel will never deteriorate through working stresses, because, unlike other materials, it retains its original strength, elasticity and reliability. So much has been achieved by the metallurgist, manufacturer, designer and builder, that it remains for the architect and owner only to insure conditions and treatment that will maintain the original integrity of the structure unimpaired by any anticipated future conditions. The vital points that practically govern the durability and safety of completed structures are: corrosion, fire hazard and the proper inspection and maintenance after erection. Their important practical features are here treated.

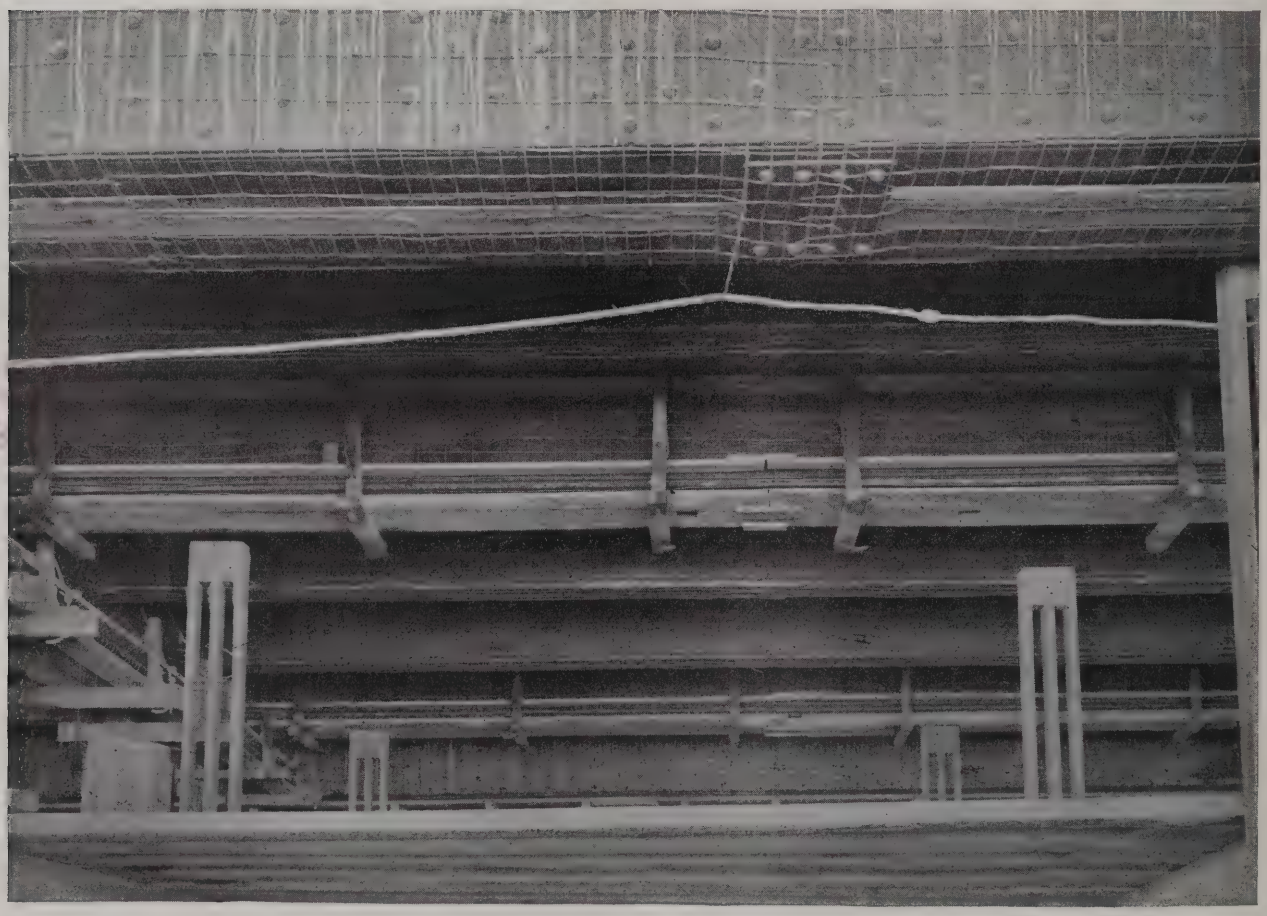
Corrosion. Under certain conditions, some of which are often continually present, all materials are subject to deterioration; wood will decay, stone and concrete will spall or disintegrate; brick and metals are subject to chemical changes that may be destructive. Almost the only agent destructive to structural steel under ordinary working conditions is corrosion, which is possible only through the presence of moisture or acids. Its prevention eliminates almost all possibility of deterioration of strength except by reason of accident, abuse or malicious treatment. Fortunately, corrosion can be absolutely prevented by keeping the steel perfectly dry and by avoiding contact with acids, fumes or liquids. Generally this is practically accomplished either by insuring a pure dry atmosphere, by encasing the steel in a solid protecting the mass, or by thorough painting. Unprotected steel should not be imbedded in cinder concrete because elements often contained in the latter are likely to promote rapid corrosion. Stone concrete or cement mortar well rammed around the steel and completely enclosing it gives a most excellent and satisfactory protection when thoroughly waterproofed. When it is applied the steel should not be covered with any oil paint, since the chemical action of the cement tends to saponify the oil and makes the paint injurious rather than beneficial. Unpainted steel may be covered with graphitic or asphaltic paint, which is often used for steel in footings, in foundations, and when exposed to wet earth. Concrete encasement is also suitable for the protection of superstructural steel when it is desirable for architectural or other purposes and

where it is properly applied, secured and waterproofed. The first inspection is likely to be the last.

In general, structural steel of all sorts may be satisfactorily protected by thorough painting. Before the first coat of paint is applied, the steel should be thoroughly cleaned; grease, scale and all dirt, old paint or other substances removed either by scrapers, wire brushes, washing or sand blast, and it should immediately after be treated with one or two coats of red lead and oil thoroughly applied on a warm, dry surface. This paint should be protected by one or two coats of some good elastic paint such as white lead and oil or other standard metallic paint. When columns, lintels, girders and other members are enclosed in outer walls, whether of concrete, or brick or stone masonry, the latter should be thoroughly waterproofed on their outer surfaces. They should be provided with horizontal water stops over horizontal members, and the steel members themselves should be thoroughly parged with cement mortar and the space between them and the masonry slushed full of mortar.

Some railroads and certain interests having large quantities of structural steelwork to preserve have developed special formulæ for their paints. It has been found that under different atmospheric conditions, different formulæ are necessary, since a paint giving excellent protection in one place may not do so in another place. Paint for the steelwork enclosed in buildings is, however, much easier to select and more durable than that applied to outside structures such as bridges. When repainting any structure, it is very necessary to first thoroughly clean it and especially to remove all dirt and rubbish. Cavities, pockets and narrow clearances likely to retain dirt or moisture should be filled with solid cement or some other waterproof material to protect the paint and prevent the accumulation of moisture or the development of corrosive acids from decaying materials. Where the steelwork is thoroughly protected by concrete or masonry covering, or where it is exposed in a dry atmosphere under cover, the original paint may remain effective for many years, and practically require renewal only for decorative purposes; but where the steel is exposed to wet or salty atmosphere, the fumes of cooking or any other acid condition, it should be frequently inspected and have thorough painting as often as the paint may show signs of deterioration. Originally exposed steel in the interiors of buildings will not require frequent painting, but exposed work may require painting every two or three years or oftener. If thoroughly painted with good materials and at sufficiently frequent intervals, it will afford complete protection for the steel against corrosion.

Fire Hazard. Steel is uninjured by ordinary atmospheric temperatures. Its strength is normal up to 200° Fahr. and increases about 25 per cent as



Beams and Girders with Steel Fabric in Place to Receive Pneumatically Applied Cement Fireproofing

the temperature rises to 500°, decreasing to normal at 800°, and to less than half the normal (to approximately the maximum permissible working stress in columns) at 1000° Fahr., above which temperature it should never be called on to carry compressive stresses. Steel is fireproofed by casing it in a complete, durable, strong covering of incombustible, refractory material that may or may not enclose an air space around the steel. Usually the encasing material is brick, tile, gypsum or concrete, with a minimum thickness of from 2 to 8 inches. If concrete is used, it should be reinforced and anchored to the steel. Concrete may be poured in moulds, or may be plastered by hand, or installed by pneumatic pressure, which increases the strength and density of thin bodies of concrete.

Most large American cities and several insurance companies and technical organizations have prepared very careful specifications to govern the fireproofing of steel structures. The specifications recently issued by the American Institute of Steel Construction provide that: "Fire-resisting insulating material shall continue to function within the temperature range of its use, and shall be so applied that it will not crack, spall, or buckle to seriously expose the steel to direct heat from fire. If the insulating of columns contemplates the use of air spaces between the steel and the insulator, there shall be fire stops placed at the floor levels. Steel buildings whose condition of exterior exposure and whose contents under fire hazards will not produce a temperature greater than 800° Fahr. in the steel shall be considered fire resisting without insulating protection for the steel. If the steel has an insulating protection, the safety factor shall be based on the fireproofing material providing protection for a greater period of time than the combustible contents of the building will burn, as shown in Section 3 of this specification; 16 pounds per square foot of combustible materials including wood floor and wood trim, constitutes a 1-hour fire hazard, 30 pounds a 3-hour hazard, 40 pounds a 4½-hour hazard, etc. The safety factor for all skeleton frames and secondary members shall be 1½. For example, if a building contains 10 pounds of combustible material per square foot of floor, and has a fire hazard of 1-hour duration, the steelwork shall be protected against the temperatures here defined for 1½ hours."

Fire Protection Specifications

The tentative 1927 specifications of the National Fire Protection Association, Boston, require that all structural steel members which support loads or resist stresses shall have a fireproof protection of brick, concrete, hollow building tile or gypsum, plaster being unacceptable. Poured-in-place gypsum or concrete shall be secured by steel anchors. Bricks or blocks shall be accurately fitted and bonded, and the spaces between them and the structural steel shall be filled solid with masonry or concrete. Bricks

Encasement on Beams and Girders is Solid, but that on Truss Members is Hollow, Enclosing Air Spaces

or blocks are to be set in Portland cement mortar except gypsum mortar for gypsum blocks. All columns and girders shall be protected from corrosion. No pipes, ducts or wires shall be placed within the fireproofing area. All wall columns shall be enclosed with not less than 3¾ inches of brick or 3 inches of concrete well bonded and anchored. Fireproofing of wall girders shall be the same as for wall columns. Interior columns shall be enclosed in a continuous casing of concrete 3 inches thick, or cast-in-place gypsum not less than 2 inches thick. Where subject to mechanical injury from trucking, handling merchandise, etc., fireproofing shall be protected by jacketing. Webs and bottom flanges of interior girders and trusses shall be protected with fireproofing not less than 2 inches thick at all points. Beams, lintels, and all other structural members except roof trusses and roof purlins shall be similarly protected with fireproofing not less than 1½ inches thick. Minor structural members supporting walls or other construction shall be protected by not less than 1 inch of expanded metal or wire lath and cement or gypsum plaster.

The requirements of the building code of the National Board of Fire Underwriters correspond in general to the specifications of the Fire Protection Association and say that hollow building tiles for fireproofing must have webs and shells not less than ⅝ inch thick. Galvanized steel wire, not less than 12 gauge, shall be securely wrapped around block column coverings so that every block is crossed at least once by a wire. The wire shall not be wound spirally, but each turn shall be a separately fastened unit. Interior metal ties or interlocking blocks are preferable to the wire winding. No blocks shall exceed 12 inches in vertical dimension. Hollow tile protection for the lower flanges of beams, etc., shall be either dovetailed to or integral with the skewbacks, with solid mortar joints. All concrete protection shall be anchored to the structural steel member with interior pieces securely hooked to the enclosed members.

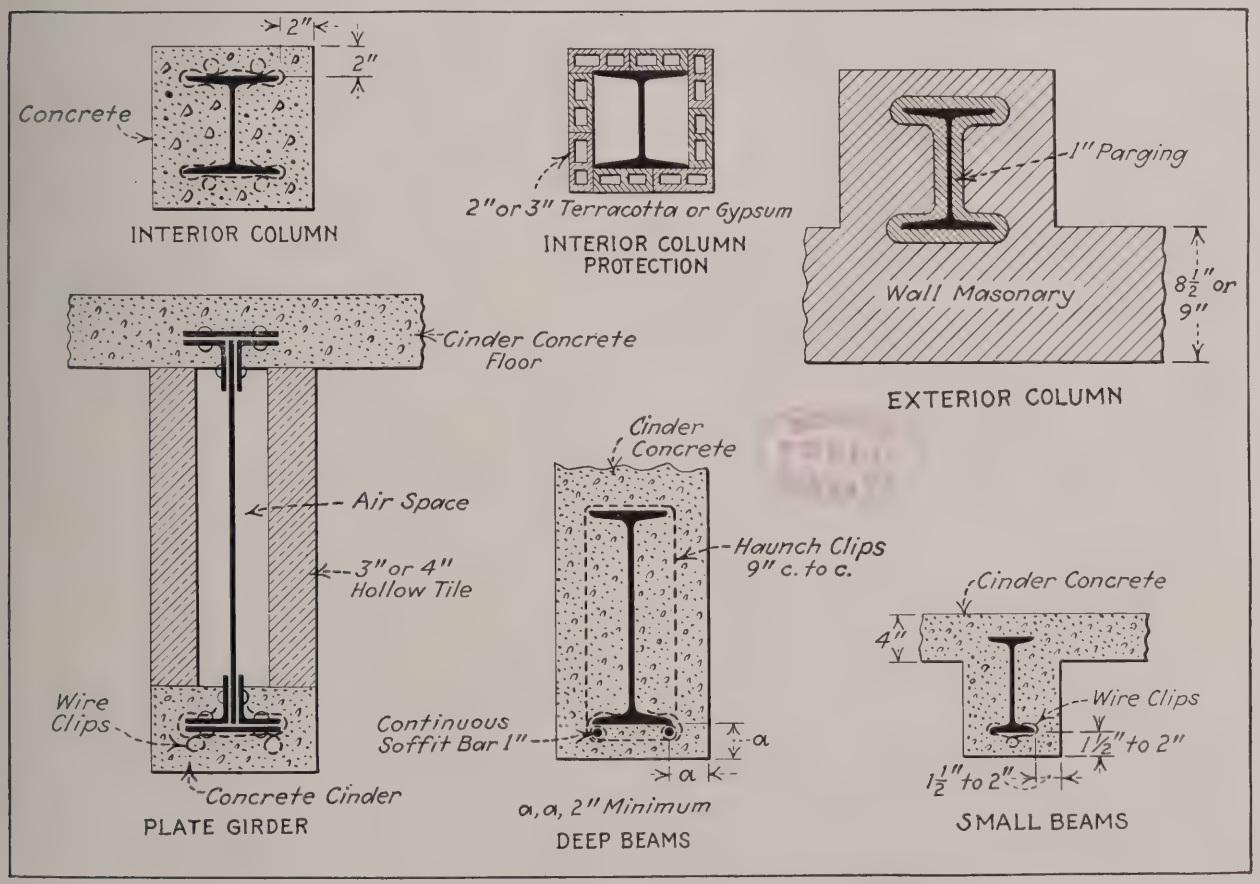
In discussing the most efficient type of fireproofing for structural steel columns, H. G. Balcom, consulting engineer, recommended a solid jacket of limestone concrete anchored to the column flanges.

Long Roof Trusses of Madison Square Garden in Perfect Condition after 35 Years of Service

A very popular alternative is the use of terra cotta blocks on all sides of the column. He recommended for ordinary beams a solid encasement of anchored concrete integral with the floor or ceiling slabs. For deep girders, the bottom flange may be protected by cinder concrete and the sides by properly secured terra cotta blocks thoroughly jointed to the floor slab. Kort Berle of the Gunvald Aus Company, consulting engineers, recommended that beams and girders be fireproofed with solid concrete encasement, and that interior columns be enclosed in a solid mass of concrete or brickwork of a minimum thickness of 2 to 4½ inches respectively. Exterior columns should have one shop coat and one or two field coats of approved paint and in addition should be well parged.

There are various types of commercial fireproofing systems and details, and special provision is made to prevent the running of any pipes, wires or conduits inside the fireproofing jacket of any column or girder, entirely separate protection or chases being provided for them as is required by the building codes. Ordinary standard specifications, construction methods and equipment suffice for fireproofing concrete that is poured in forms, but to secure the durability, strength, hardness, watertightness and greatly decreased volume and weight, fireproofing pneumatically applied to any steel members should be made with the proportions of one bag of Portland cement well mixed with 3 cubic feet of dry screened sand under a minimum pressure in the receiving chamber of 30 pounds, mixed at the discharge nozzle with clean water at 60 pounds, and delivered at right angles to the fireproofed surface. The fireproofed members must be thoroughly cleaned of all paint, grease, rust, etc., and have ½-inch holes approximately 3 feet apart in the webs close to the top and bottom flanges. Anchor rods shall be secured through these holes, and to them longitudinal rods shall be attached and wired about every 12 inches to galvanized welded fabric or expanded metal of required size and weight that has been carefully cut to size and bent over templates so as to closely follow the outline of the member and insure a minimum thickness of ¾ inch of protection.

The outer edges of flanges and stiffeners are squared to true lines by the use of detachable "shooting strips." The main surfaces of girders, beams, columns, etc., are trued before the cement sets, by cutting off all high spots with the sharp edge of a trowel and dragging the surface with a wide, long-haired, wet, whitewash brush. Cement must not be placed during freezing weather, nor against frosty surfaces, and it must be kept wet for at least one week after placing. In no case shall the thickness of the cement be less than 1½ inches on vertical surfaces and above horizontal surfaces, and not less than 2 inches below bottom surfaces and around edges of lower flanges. Thickness shall be measured from the surface of the steel and not from the tops



Types of Fireproofing for Columns, Beams and Girders

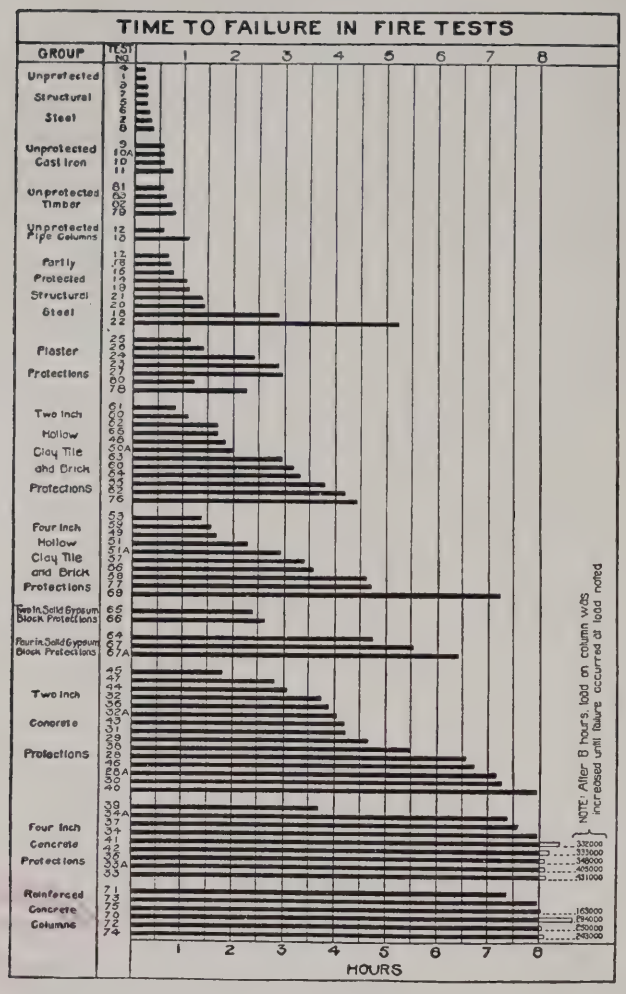


Table of Results of U. S. Bureau of Standards' Test of Columns and Fireproofing

of rivet heads. A Columbia University test of a pneumatically built cement slab was made with an average temperature of 1695° Fahr. for three hours, combined with a load test of 40 pounds per square foot, and after cooling, a load test of 200 pounds without failure, the 200-pound load producing tensile stresses of 7,450 and 62,000 pounds per square inch in the concrete and steel, respectively.

Examples of Steel and Wrought Iron Buildings. No deterioration was observed in small wrought iron beams removed after nearly 100 years' service in an old shot tower in New York. The roof trusses over the main shop of the Dominion Bridge Company, Montreal, erected in 1884, have been seriously overloaded, exposed to very injurious smoke and fumes, seldom repainted and never reinforced, yet they are still in service, and are considered to be in good condition. The Woman's Temple, one of the first so-called steel frame buildings in Chicago, was removed after 33 years, and only very slight deterioration was found in any of the steelwork. The Tower Building on lower Broadway, erected in 1888, was called the first steel cage building in New York, and its I-beams were in good condition when removed after 26 years' service. After 30 years' service the steelwork in the Benoist Building, St. Louis, was found as good as the day it was erected. I-beams in the Rand & McNally Building, one of the first tall buildings in Chicago, were recently exposed during its demolition and found uninjured. About 300 tons of steel I-beams were salvaged and re-used in new building construction after 25 years' service in a New York hotel. When recently demolished to make room for modern structures, the steel frameworks of the Savoy, New Netherland, and Delmonico Buildings, New York, were found in good condition. Well protected steelwork, although exposed to dust, moisture, and sulphurous fumes, does not show deterioration in two generating stations and 15 sub-stations about 30 years old of the Brooklyn Edison Company, the framework being now in perfect condition. On a 40th Street, New York, sidewalk, I-beams, only partly waterproofed, showed no deterioration after 20 years' service. Foundation girders in the Samson Building, New York, were painted with graphite and asphalt, and were found uninjured after 22 years' exposure to drip and moisture. Many hundred tons of structural steel and iron were used in the roofs, floors, columns, and great trusses of the famous Madison Square Garden, New York, which was built about 35 years ago. When it was razed in 1925, careful inspection was made of its framework, and except for a very small portion of the ornamental top of the tower (perhaps 1 per cent of the whole) that was exposed, unprotected, seldom or never visited, and entirely neglected, all of the steel and iron was found in perfect condition; as good as new. Large quantities of the I-beams were salvaged for re-use, and the great long span roof trusses were very carefully removed and stored for re-erection in a new building. Generally the I-beams provided by the demolition of old buildings are salvaged, cut to required lengths and sold for erection in new buildings. Columns, girders and other fabricated members could also be salvaged if their details and dimensions were adaptable to new work.

Jacob Volk, New York house wrecker, says: "In the demolition of more than 200,000 tons of structural steel and iron, the condition of the steel has been found, in general, excellent, and 90 per cent of the floor beams are reused." E. A. Prentis, president, Spencer, White & Prentis, New York, who for many years has done a large amount of underpinning, exposing old foundations at and below ground water level, says: "Usually the steel in them is in good condition; never dangerously corroded. In designing thousands of foundation piles made of heavy steel pipe, filled with concrete, an excess of 1/16 inch in thickness is ample to allow for corrosion. That portion of the unpainted pipe driven into clay or firm soil sometimes does not corrode at all, but usually the exterior does corrode a little, and the corrosion ceases, the oxidized steel combining with the earth to form a hard, dense jacket, resembling iron ore, that, when knocked off, discloses a

bright, smooth, clean, uninjured metal surface, apparently free from progressive corrosion. This condition has been repeatedly observed in the oldest piles of this type in New York that have been in service 20 years or more." Answering charges of deterioration of the famous Eiffel Tower, erected in an exposed situation in Paris, M. Hubie, Chief Engineer 16th Arrondisement, Paris, and Secretary of the Eiffel Tower Inspection Committee, recently wrote: "We do not see any reason why the Eiffel Tower should not last indefinitely if properly cared for," and C. Marc, C.E. Administrator of the Eiffel Tower Society, says: "The Tower is in as good condition today as the day it was built."

In an exhaustive research of structural steel in the United States and Canada, conducted in 1926 by the writer for the American Institute of Steel Construction, a questionnaire of 63 interrogations on their practice, observation, records, opinions and beliefs regarding the principal features of the deterioration, durability, and best maintenance of structural steel was addressed to more than 1,000 of the most eminent engineers, architects, and builders in this country and Canada. From about 17,000 items of replies received, and from conferences with, and letters from more than 200 prominent architects, engineers and contractors of long experience in New York, Boston, Philadelphia, Chicago, San Francisco and other cities, these details were tabulated:

The safety of a structure in general is not endangered by corrosion.

There need be no fear of serious results from corrosion in well designed and maintained buildings. Serious corrosion in buildings would become obvious to reasonable inspection before the building could be endangered.

The worst peril from corrosion is due to accumulation of dirt and filth, from exposure to moisture, salt air, acid fumes, brine, and other artificial conditions.

All steel may be protected from corrosion.

The protection of buildings from corrosion may be 94 per cent perfect.

The best protection from corrosion is afforded by painting and cleaning.

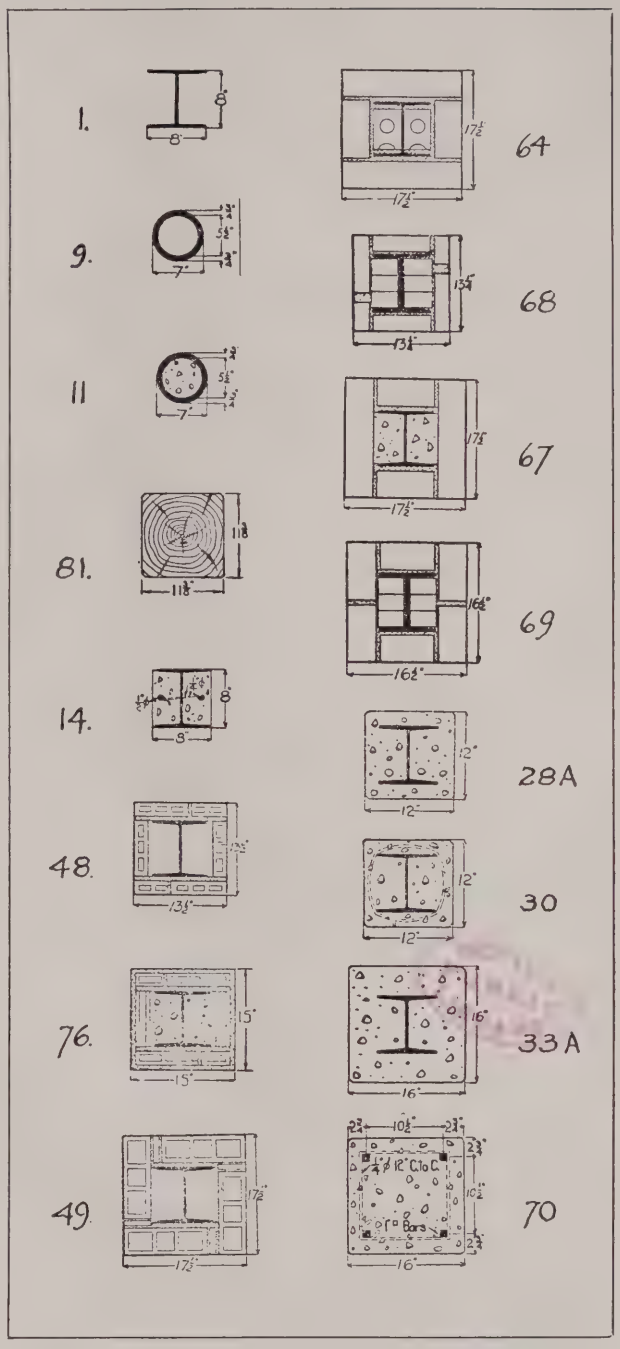
Very efficient protection from corrosion may be afforded by enclosing it in dense, fine, stone concrete.

Unless buried or encased in concrete, steel should be protected by a priming coat of red lead paint followed by an elastic coat of waterproofing paint. Graphite or asphalt paint should be used rather than oil paint on steel enclosed in concrete.

Exterior walls containing steel members should be waterproofed, and stop courses built over lintels and wall girders.

There is no limit to the life of properly protected steel.

The worst neglect causing corrosion is failure to keep it clean and dry, and failure to provide good and adequate painting.



Sections of Several Columns Tested (Numerals Refer to Test Numbers of Table on Page 574)

There is practically no danger of corrosion from electrolysis.

The actual values and comparative efficiencies of different types of fireproofings on different steel columns have been thoroughly investigated by a recent series of official fire tests on building columns, etc.

Official Fire Tests of Structural Steel Columns. "Fire tests of Building Columns," Paper 184, published April 21, 1921, by the U. S. Bureau of Standards, describes in great detail 96 tests of structural steel columns made in Chicago in 1917 and 1918 under the joint direction of the Associated Factory

Mutual Fire Insurance Companies, the National Board of Fire Underwriters, and the United States Bureau of Standards. They were made to ascertain, first, the ultimate resistance against fire, of protected and unprotected columns as used in the interiors of buildings; second, their resistance against impact and sudden cooling from hose streams when in a highly heated condition. The columns were of ten standard cross sections, with cross sectional areas varying from about 7 to 14 square inches, lengths of about 12½ feet, and designed for working loads of approximately 100,000 pounds. They were tested without protection; partly protected by concreting interior and re-entrant spaces; protected by 2-inch or 4-inch thicknesses of concrete, hollow clay tile, clay bricks, gypsum blocks; and by single or double layers of metal lath and plaster. The load pressure was uniformly maintained while the columns were heated in a gas-fired furnace whose temperature rise was regulated to conform with a predetermined time-temperature relation. Elaborate measurements were taken of the temperatures of the furnace and test columns, and of the deformations of the latter, due to load and heat.

Firproofing was applied so as to reproduce, as nearly as possible, conditions obtaining in building construction. The machine-mixed concrete was spaded inside the forms which were tapped with hammers. The overtapping joints of wire lath were wired, the lath was supported on ⅜ x ¾-inch channels, and the plaster coats were of maximum thickness. Hollow tiles and bricks were set in cement mortar, and when concrete was placed between tiles and column, the tiles were held in place by clamps 2 feet apart. Gypsum blocks were set in 1:3 gypsum mortar. The load pressures were applied by a hydraulic ram of 545,000 pounds' capacity and an accuracy usually within 1 per cent. The 7 x 7-foot brick testing chamber 12 feet high had four primary gas burners in the corners that were supplied through a 6-inch pipe from the city mains. Two of the furnace walls were movable to permit the application of a stream of cold water delivered through a 1⅛-inch nozzle. The columns in the fire test series were subjected to a constant working load and fire exposure, increasing according to a predetermined time-temperature relation until failure occurred, or until they had withstood the test eight hours or more.

In the fire and water tests, the working load was maintained constantly, and the column exposed to fire for a predetermined period when water at given pressures was applied by means of a hose stream. In case the columns withstood the fire test, they were immediately loaded to failure under full fire exposure. In the fire and water tests, three columns were loaded to failure after they had cooled, and four columns were loaded to twice the applied working load and then reserved for further tests. The time to failure in the fire test extended from the beginning of the test to the time when the column was unable to sustain the working load. The duration of the fire and water test period varied from 22½ minutes to one hour, and that of the subsequent water application from one to five minutes. The length of the maximum period of fire was the time within which the water is generally applied in building fires, estimated at one hour.

Maintenance. In order to insure the continued integrity of the steel framework of a building that has been properly designed, constructed and protected as has been here described, it is necessary that it should receive adequate periodical examinations and such maintenance as is required to prevent any injury or to correct any incipient trouble. Certain portions of the structure,—such as the steelwork in the foundation and footings and the steel embedded in exterior walls scrupulously protected with adequate covering,—are undoubtedly permanently safe, and need never be disturbed, notwithstanding the hysterical demands of a newspaper which insisted that the walls and foundations of important structures should be frequently torn open.

Wherever there is reason to fear the penetration of corrosive liquids, gases or moisture, there should be preventive measures taken. Ordinary corrosion, though it may present a rough and a scaly exterior, is seldom structurally important, unless long continued, and a very rough surface may not indicate the loss of 1 per cent of the original strength and efficiency of the member, an amount which is entirely admissible without impairing the safety of the steel. Extreme cases of excessive and prolonged corrosion may demand the replacing of the member. Usually a casual examination of the most exposed and vulnerable parts of the interior framework will indicate whether corrosion is present, and if found, it generally is necessary to repaint only the member and maintain the required protecting jacket to insure its safety. When local spots of corrosion are detected, they should be removed immediately and the places covered with one coat of red lead and oil plus the application of an additional coat of paint entirely covering the structure or members.

Exterior steelwork must be carefully and thoroughly inspected at intervals of from three months to one year, according to the character of the structure and the conditions obtaining. Two kinds of metal must not come in contact where there is a possibility of there being moisture. There should be no narrow spaces between or around steel members or portions thereof, and there should be no contact with dirt, rubbish, or any other materials at places where moisture or filth can accumulate. If such are inevitable, they must always be frequently exposed and cleaned, unless it is possible to eliminate them by filling with solid waterproof, watertight materials. The greatest care must always be taken to keep steelwork clean and dry. Accumulation of any kind of dirt or rubbish must never be permitted. If it is kept clean, and dry, and well painted, the steel's working life should be unlimited. Proper protective encasing of steel insures its structural integrity.

LINOLEUM AND CORK COMPOSITION FLOORING MATERIALS

BY
C. STANLEY TAYLOR

RESILIENT flooring materials are the outgrowth of a definite need for a suitable and economical floor over wood, concrete and other hard floor surfaces, and for a material which can be easily applied as a replacement floor over old floors of any type. Cork composition products and rubber are the principal flooring materials having resiliency as a dominant characteristic. They have been evolved through many years of development and improvement, and have today reached a state of perfection and quality which places them very definitely in the class of quality materials having distinctive characteristics not present in similar combinations in any other type of floor surfacing material.

We are concerned in this discussion primarily with cork and cork composition floorings, which are known in the trade under the general titles of linoleum, linoleum tile, natural cork tile, and cork carpet. The evolution of cork composition flooring materials from the status of a floor cover to that of a finished flooring material has been slow, and architects have only recently awakened to the intrinsic values which such materials possess as contrasted with their use primarily as substitutes or replacement coverings. It must be acknowledged today that these products have earned for themselves a definite, permanent place in the building field, and that they offer to architects, builders and owners new opportunities for creating special effects in color, pattern and texture and for introducing other values of comfort, quietness, sanitation and maintenance that particularly adapt them to solving many modern flooring problems.

Types of Cork Flooring Products. The various types of resilient flooring materials, of which cork in some form is the principal component, each possess special characteristics which make it important to differentiate one from the other, both in this discussion and in the use and specification of such materials. The prevalent use of trade names to distinguish the various types of products is somewhat confusing, and we must go back of the distinguishing and commonly employed trade names and classify the products in another manner. There are three major classes of cork flooring products; (1) cork composition floorings, broadly termed linoleums and linoleum tiles; (2) natural cork tiles; (3) cork carpets. Their characteristics deserve consideration.

Natural Cork Flooring Products. Cork tiles are composed of particles of cork, such as the thin shavings of cork which are largely produced as a by-product in the manufacture of cork bottle stoppers. These particles are compressed under heat in such a manner that the natural gums of the cork are liquified and form the only binder required to produce a firm, rigid, and homogeneous product. The better grades of natural cork tile contain nothing but pure cork without any of the harder bits of cork bark or other foreign ingredients. The tile forms come in various size, usually in square or rectangular shapes, and in thicknesses ranging from approximately ¼-inch to ½-inch.

Natural cork tiles take their color from the cork itself and from the baking process which is essential to their manufacture. They are thus available only in natural cork browns of various shades, ranging from light to dark, according to the amount of heat applied. The extreme hydraulic pressure usually employed in the manufacture of cork flooring produces a material which is quite resistent to wear and abrasion, and which is at the same time highly resilient, quiet, and pleasant to walk upon.

Cork Tile Showing Random Use of Several Shades

Embossed Inlaid Linoleum Resembling Tile Floor

Embossed Inlaid Linoleum Indicating Adaptability to Definite Architectural Styles

Cork Composition Flooring, Linoleum. In this type of flooring ground cork is a principal ingredient. The cork is pulverized almost to the fineness of flour and is mixed with oxidized linseed oil and various gums, fillers and pigments. The mixture is compressed under huge heated calendar rolls onto a burlap backing employed as a measure of reinforcement on the underside. A process of curing the cork composition aids in producing a firm, homogeneous material of considerable resiliency which will not buckle or crack and which is practically free from odor. Cork composition floorings are available in many forms and in a number of distinct types. The sheet forms may be classified as Battleship Linoleum, Jaspe, Inlaid Linoleum, Embossed Linoleum and Marbleized Linoleum.

Battleship Linoleum is a high quality, plain color cork composition flooring in sheet form, which earned its name from its original use as a decking material over the steel decks of warships. It is available in various thicknesses from slightly less than ⅛-inch to a full ¼-inch.

Jaspe Linoleum is distinguished by its striated pattern in two tones of a single color, giving a variegated effect and a characteristic appearance of graining. It is otherwise similar to Battleship Linoleum in its composition, and is usually available in three weights. Small insets of contrasting color are frequently used in Jaspe Linoleum with interesting effects.

Inlaid Linoleums have various patterns in which each individual color runs through to the burlap back. In surface appearance these linoleums often resemble a floor laid with individual tiles, but possess the advantage of lower initial cost and considerably lower laying cost because of its sheet form. This type of linoleum is available in many combinations of colors and in a wide variety of patterns, some of the small tiles forms resembling mosaic tiles, and some patterns resemble quarried tiles or blocks of cut stone or slate, as well as other designs.

Embossed Linoleums are usually inlaid linoleums in which an apparent joint is introduced between the tile units of the pattern, and this joint is compressed below the surface of the sheet to give the appearance of a masonry joint in a hard tile floor. The tiles themselves may also be embossed for decorative effects.

Marbleized Linoleums are classified separately because of their special appearance. Ingenious processes of manufacture result in producing a variegated color effect which resembles with remarkable fidelity the color and appearance of fine marbles, there apparently being no limitation to the manufacturing process in the reproduction of all types of colored marbles. Marbleized Linoleums may be in either full sheet forms, in which the marbleizing effect is carried out over the entire sheet, or of the inlaid type, having the appearance of blocks of marble laid in pattern.

The tile forms, which are sold under various distinguishing trade names, are essentially the same as in the sheet forms in composition but are usually available only in plain colors or in marbleized effects. There are in addition a number of newer types constantly being developed which produce various special flooring effects, including a reproduction of wood plank floor, accomplished by using the Jaspe Linoleum with inset joint strips, pegs and butterfly wedges of darker color. The tile forms are in plain colors and in marbleized effects. Some manufacturers are producing an embossed tile for special uses which have the appearance of decorative faience tiles and which are employed to introduce variety and interest in the pattern of a floor. The architect has at his disposal, in these materials, floorings to harmonize with any designs.

Cork Carpet. Though frequently classified with linoleum, cork carpet differs somewhat from both cork tiles and linoleums. It is composed of granulated cork using a different proportion of cork and linseed oil from that usually employed in Battleship Linoleum. It is compressed under heat. As the name implies, it is manufactured in sheet forms. It comes in several solid colors, and in thicknesses of approximately .22-inch (polished) and .26-inch (unpolished). Cork carpet has not the density nor therefore the resistance to wear of the several types of cork composition flooring materials, but its great resiliency and relatively low cost give it a very

definite utility for solving certain flooring problems.

These classifications cover the principal standard types of cork composition flooring, but it should be noted that each individual manufacturer is constantly developing new combinations and new patterns which have their special uses from both the decorative and service point of view. The essential features here noted, however, may be applied to the newer forms, and hence an extended discussion of them is not necessary before we proceed to the next consideration.

Border of Marbleized Linoleum as a Transition from Inlaid Marbleized Pattern to Embossed Tile Pattern

An important new development in the manufacture of linoleum and cork composition flooring materials is the utilization of pyroxylin or nitrocollulose lacquers to produce a surface wholly impervious to moisture, dirt and to the staining effects of many common materials such as ink, foods, greases, mild acids, and even synthetic gin. The lacquer finish is not merely a surface painting in the ordinary sense, for the leading manufacturers while retaining in secrecy the exact nature of the process employed, claim and demonstrate that there is a certain amount of penetration of the lacquer into the upper strata of the material, although no manufacturers claim complete penetration. The lacquer functions to close the minute pores in linoleums and other cork composition flooring products so that ordinary dirt and dust will not be ground into the surface, vastly simplifying the cleaning and maintenance operations. The nature of the lacquer employed is such that most common substances which will normally stain wood, marble, concrete and other types of flooring will not penetrate into the cork compound, and a spot can be readily wiped off from the surface without leaving any stain or mark. To a large extent the lacquer treatment eliminates or minimizes the need for waxing linoleum floors for their maintenance and preservation, although wax may be applied as usual if desired. Undoubtedly this new development marks a real advance in improving the life and utility of cork composition flooring materials, giving added qualities of sanitation, low maintenance cost, improved appearance and probably greater durability.

Appearance and Service Characteristics. While architects universally appreciate the decorative importance of floors in every type of room where architectural design deserves the least consideration, they also know that the selection of flooring materials must depend also on many service factors, including durability, safety (which means freedom from excessive slipperiness when either wet or dry), ease of maintenance, ease of replacement, sanitation, quietness and comfort, and economy. To a surprising degree, cork composition and linoleum floorings possess the qualities of an ideal flooring material. It is hardly necessary to stress the appearance factor. The variety of colors and patterns available, not only in the sheet forms of linoleum, but also through the employment of the tile forms with which the architect can develop individual patterns to meet the specific design problems, is equaled by no other type of flooring. Color in almost unlimited variety is available in all forms except Battleship Linoleum, cork carpet and natural cork tile; the latter being confined to natural brown tones, and the first being available only in a limited number of plain colors, though special colors can be produced on large orders. The use of sheet linoleums and the tile forms in combination, one for the border and the other for the field, and the opportunities for developing special patterns by inlaying the sheet forms with decorative units of almost any required shape and color, gives further versatility to this type of flooring and challenges the ingenuity of the architect to create decorative effects appropriate to every architectural style, and to every design problem.

We have already noted the inherent resiliency of cork composition products, which is responsible for their making an exceptionally quiet and comfortable floor. From the safety angle, linoleum and cork flooring materials possess the well known non-slipping characteristics of plain cork when either wet or dry. The use of a wax finish for maintenance purposes introduces a slight hazard, but if the wax is thoroughly rubbed in and polished it does not pre-

Special Pattern Set in a Marbleized Linoleum Floor

sent a slippery or dangerous surface. Linoleums also possess sanitary qualities in a high degree, particularly those which have been manufactured with the lacquer treatment.

Maintenance of linoleums and other types of cork and cork composition flooring is largely confined to waxing at periodical intervals and to dry cleaning with a soft brush on all other occasions. The use of caustic or gritty soaps or scouring compounds is both unnecessary and positively harmful to these flooring materials and should never be permitted at any time, though the newer forms employing the best lacquer treatments are not likely to be harmed. Occasional washing with a mild household soap, washing a small area at a time and following the washing by immediate wiping with clean water, is permissible a few times a year, but the waxing process alone should be sufficient to remove surface dirt and leave a clean and fresh surface. Many of the difficulties that have been encountered with linoleums in the past have been due to the excessive use of water and strong soaps in their daily maintenance. These service characteristics are accompanied by ease of replacement where worn spots must be removed, a feature particularly notable with the tile forms, one or more of which can be readily taken up and replaced without relaying the entire floor. They are also accompanied by the important factor of considerable initial economy, for linoleum and cork floorings are less expensive than any other type of finished flooring material or floor covering, having equal characteristics of quality, durability, resiliency, color and pattern.

Proper Use of Cork Composition Floorings. The selection of flooring materials is properly based upon their characteristics and cost, and it is hardly necessary to itemize the types of floor space for which linoleums, cork composition tiles and pure cork flooring materials are adapted. It is sufficient to note that they have properly come into general use in residences of all types, and in any room, not as a substitute material, but primarily because of their distinctive features which adapt them to both the decorative and service requirements of domestic interiors. They have earned a prominent place in commercial and institutional buildings, particularly those which have concrete structural floors, because of their resiliency, comfort and quietness, their ease of maintenance, their excellent appearance, and their low cost. The Battleship Linoleums particularly make excellent service floors in commercial, industrial and institutional buildings of all types where trucking is not required.

One precaution should be noted in connection with

Sunburst Design Set in Linoleum Floor with Striking Effect

Unlimited Variety Is Possible with Inlaid Linoleum

the use of resilient flooring materials. Heavy furniture standing on small casters or slender legs may compress the flooring and form a disfiguring indentation which will be apparent whenever the furniture is moved. For this reason architects should take care that their clients utilize wide face casters, caster cups, or the newer types of broad faced sliding casters or gliders on all furniture, a matter that is equally important for the protection of fine wood or marble floors.

In specifying linoleum and cork composition flooring materials, the architect should be concerned primarily with two considerations. First, the service characteristics of the floor should be adapted to the traffic which it must bear. The quality of the flooring material should also be related to the service requirements, for as in the case with every other building product, there are wide differences in quality and cost, and usually the best grades are lower in ultimate cost than the cheap products.

The second consideration involves the problem of laying. It is impossible here to describe in detail the correct laying methods for each type of floor, and it is quite unnecessary to do so, for the best results are obtained when the manufacturer's instructions are made a part of the specification and where, if possible, the floor laying contractor is one whose work is approved by the flooring manufacturer. The reason for this lies in the fact that use of correct laying methods produces a far superior result,—to such an extent that the method of laying is often considered of importance equal to the quality of the flooring material. Careless contractors and those who are untrained in the work will not only use inferior cements but will frequently omit the rolling and the use of sand bags or weights to hold the linoleum or tile in place while the cement hardens.

The manufacturer's specifications should also be followed with respect to the preparation of the subfloor surfaces and to the use of suitable flooring felts under linoleums and sometimes of rosin-sized paper under cork tile, where these materials are installed over a wood floor. With these simple precautions and with careful supervision of the work, the architect may be sure of a satisfactory floor. It is never desirable, however, to lay these floors on wood or ordinary concrete in direct contact with the ground, either on or below grade.

Marbleized Linoleum in Contrasting Squares

In summarizing, it is perhaps worth while to point out the importance of these low cost resilient flooring materials as an alternative for more expensive types of flooring in those cases where the construction budget has been exceeded in the early part of a project, necessitating a reduction in finishing costs.

Jaspé Linoleum with Inset Pattern Used on Hospital Ramps

Cork Composition Flooring Repeating Ceiling Design

Cork Composition Flooring in Square Tile Form Used in Lobby of Small Theater

Resilient, Durable and Quiet, Cork Composition Floors Are Extensively Used in Offices

This circumstance arises so frequently that architects are often put to a severe test of their ingenuity and inventive genius to find materials which will produce a desired decorative effect and at the same time represent a substantial saving over the cost of luxurious or heavier materials having the same appearance. It is important to bear in mind that the comparative low cost of resilient cork and cork composition floorings, combined with their many excellent characteristics, renders them exceptionally well adapted to the economical flooring of all types of buildings, and in harmony with any architectural style.

Battleship Linoleum Is an Ideal Floor for Many Commercial and Industrial Uses

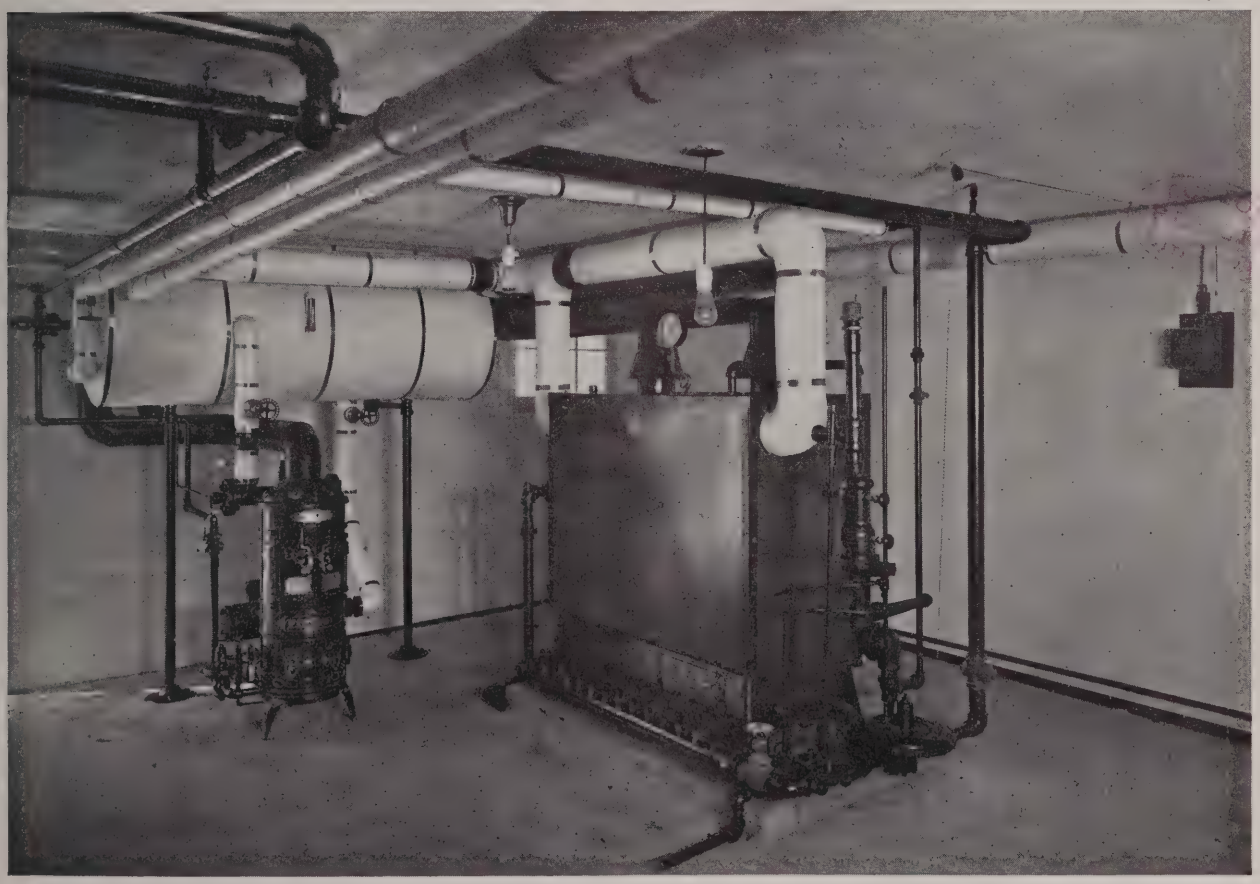
GAS IN THE AMERICAN HOME

I. HEATING WITH GAS

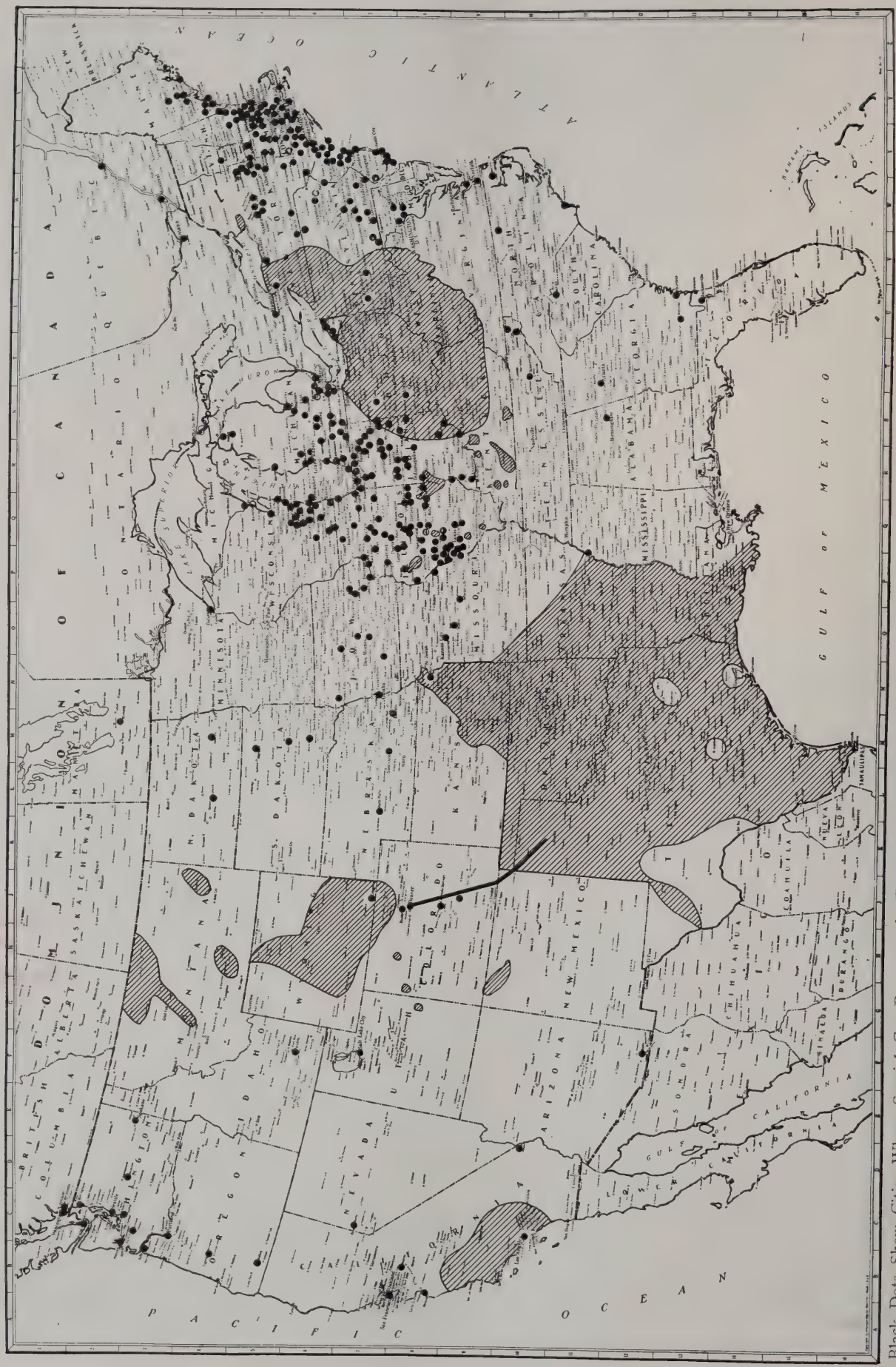
BY P. E. FANSLER
ASSOCIATE EDITOR, THE HEATING & VENTILATING MAGAZINE

GAS is serving the home owner in many ways not dreamed of when public utilities were first incorporated as "The Citizens' Gas Light Company" or under some similar title selected to suggest the scope of usefulness of this product. Executives of many of these utilities were gravely concerned when the use of electricity for illuminating purposes spread through the country like wildfire; they imagined that the knell of the gas industry had sounded. Fate was not so unkind, however, and the use of gas for cooking soon caused demands far in excess of the old lighting loads. Then came the beginning of the present phase,—the era of fluid fuels,—and far-seeing executives have already started aggressive campaigns for house-heating loads as well as for the other uses of gas that are now so much talked about,—refrigeration, incineration, air conditioning, and water heating. Also there came the development of industrial gas applications,—in laundries, bakeries, heat-treating and other metallurgical plants, for brick making, peanut roasting, and un-numbered highly specialized uses. It does seem passing strange that gas company officials wept at the thought of losing thousands of lighting customers who turned to electricity, when today there passes through a single meter, in any one of the great industrial plants, more gas than was registered in a multitude of little meters serving the house-lighting load of those old days,—and payment comes in a single check, in place of in thousands of small cash payments, with the requisite bookkeeping and accounting cost.

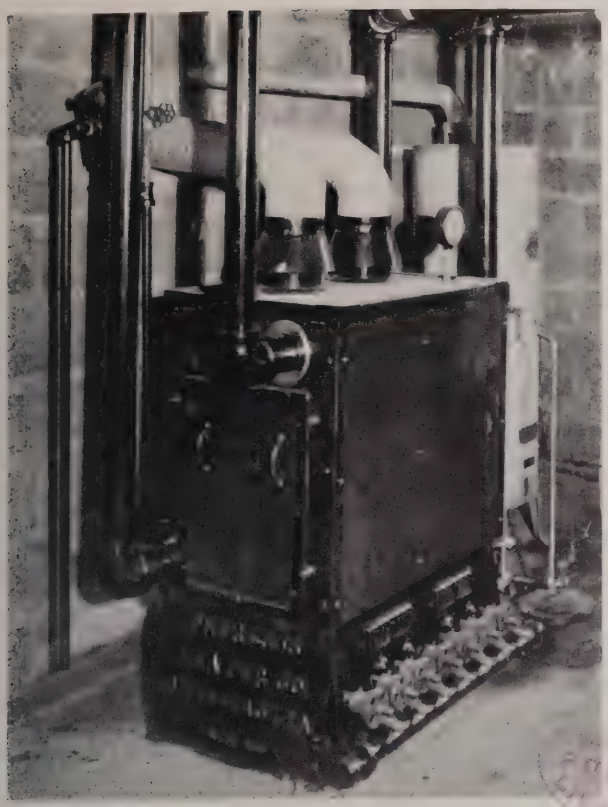
This article deals with the use of gas as a house-heating fuel; a second article will discuss the apparently paradoxical use of gas for household refrigeration as well as for the other comparatively recent applications, in the home. Househeating with gas, both natural and manufactured, is attracting the attention of the architect and heating engineer largely through a concerted and nation-wide educational campaign on the part of the organized manufacturers of gas, retailers of natural gas, and the manufacturers of gas-heating equipment. These activities were stimulated, if not initiated, by the tremendously rapid increase in the use of oil as a domestic fuel during the last three or four years. Several far-seeing executives of gas companies, in as many scattered cities, have quietly been working out the problem for the last ten or more years, and many of the



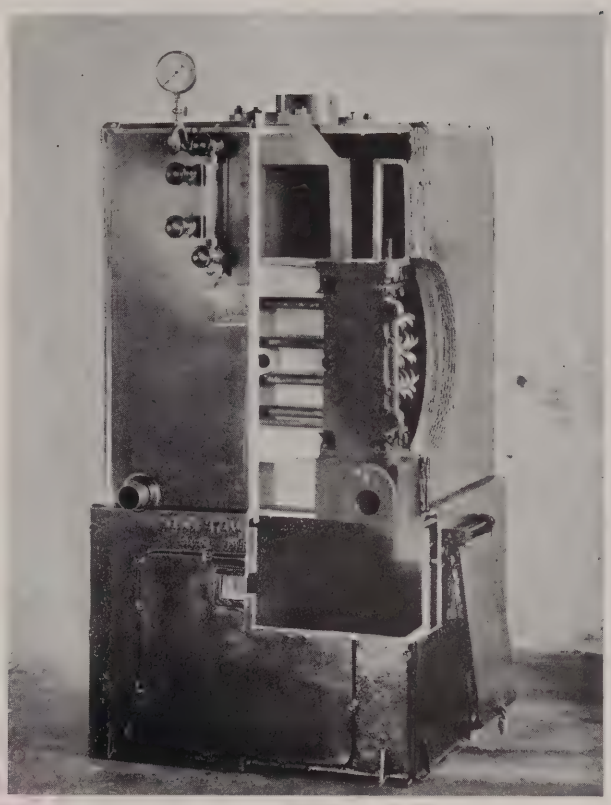
A Gas-fired Heating Plant with Automatic Control of the Steam Circulated, and Automatically Controlled Gas-heated Domestic Hot Water Supply



Black Dots Show Cities Where Special Gas Rates are in Force for House Heating. Shaded Areas Show Fields of Natural Gas. Heavy Line Indicates One of Many Large Pipe Lines for Natural Gas



Typical of the Compactness and Cleanliness of Gas-fired Boilers for Fairly Large Houses



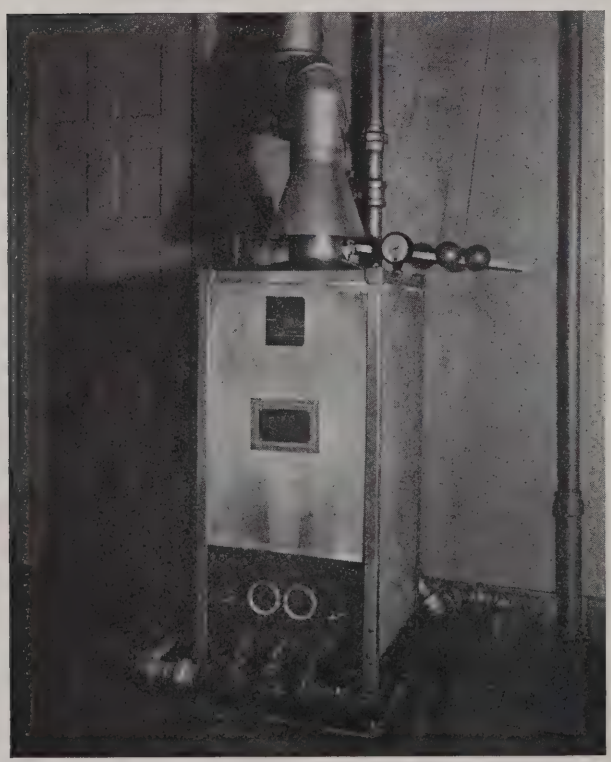
Cut Section Showing Construction of Boiler Designed for Gas or Oil. Copper Tube Elements Removable

essential factors have been definitely established. The nation-wide campaign for this market has only started within the present year, and the next ten years undoubtedly will see an enormous growth in the ranks of gas users.

Broadly speaking, there are two kinds of gas fuels and two methods of using either. Natural gas, used in the gas areas and in large population centers to which it is piped, contains from 1000 B.t.u. to 1100 B.t.u. per cubic foot, and sells for from 35 to 60 cents per 1000 cubic feet. Manufactured gas is fairly well standardized at 535 B.t.u. per cubic foot, and costs, as a domestic fuel, from 70 cents to $1. Thus it will be seen that the home owner who has natural gas available at the average cost, pays 50 cents per 1,000,000 B.t.u., in contrast to the user of manufactured gas, who has to pay, on the average, $1.50 for the same quantity of heat. Either kind of gas can be burned in a boiler or furnace designed and built especially for the purpose, or a special type of gas burner can be installed in any furnace or boiler designed for coal,—this latter being termed a "conversion" installation. Quite naturally, conversion installations originated in the natural-gas areas, in the early days, when this fuel sold approximately for "a quarter" per thousand. Efficiency was not thought of, and the wastage seems criminal. Even today, in some of these sections, gas street lights are used and allowed to burn all day,—it is cheaper than paying for the labor of lighting and extinguishing!

From the technical standpoint, there are three interesting features of the gas-fired boiler or furnace. Gas is a hydro-carbon, with a large proportion of its contents hydrogen in both free and combined states. The natural consequence of combustion is the combination of this hydrogen with oxygen to form water vapor, in volume about equal to the volume of the gas. Approximately 10 per cent of the heat energy in the gas is represented in this transformation, and this cannot be utilized unless the flue gases are cooled to their dew point,—about 130° Fahr. On account of the large amount of water formed by this condensation, it is usually desirable to keep the fine gases well above this temperature. Conventional combustion practice has been to mix the necessary air for combustion with the gas prior to initiating combustion, producing the characteristic blue flame of the Bunsen burner. Gas burned for illumination, on the other hand, is emitted from a small hole in a burner, and the flame is filled with minute particles of free carbon, heated to incandescence before the oxygen of the surrounding air has an opportunity to combine with it; it is the luminosity of these particles that gives to this flame its high emission of radiant heat. The Bunsen flame, however, produced by gas burners, emits but little *radiant* heat. As a consequence, in boilers and furnaces designed for gas firing, little or no attempt is made to absorb heat energy radiated by the flame; rather, there is provided a comparatively large amount of flue surfaces, with

Even a Small House, such as this, may be Heated Economically with Gas where Rates are Favorable



This Gas Boiler, in the Small House Illustrated, is about a Foot Square

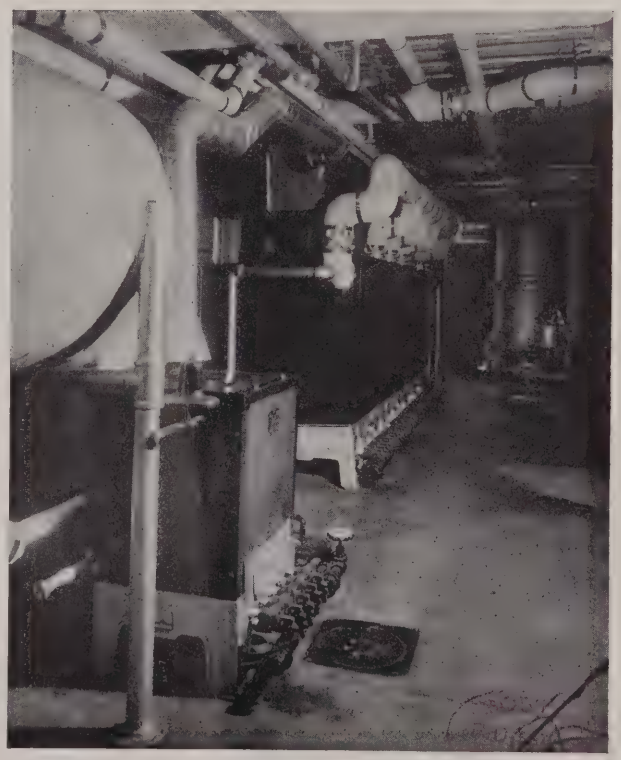
water on the opposite side in boilers and air in furnaces, for heat transfer from the hot products of combustion. It is this combustion characteristic that has dominated boiler design.

The third feature of the gas-fired boiler lies in the fact that combustion is best promoted when there is virtually no draft. Therefore, when a gas-fired boiler is attached to a chimney, a "draft-breaker" is inserted in the flue pipe, between the boiler and the chimney. This consists of a double-cone-shaped shell of sheet metal suspended in the axis of the smoke pipe, where a section of the pipe, 6 to 10 inches long, has been removed. A "skirt" is fixed to the upper part of the break. Hot gases flowing up the smoke pipe are carried around the double cone and up the chimney by virtue of the draft in the latter. Air is drawn in around the opening, nullifying the effect of the chimney pull on the boiler. If there should be a "back-draft," or downward movement in the chimney, it would be diverted by the cone and would pass out around the opening and not interfere with the functioning of the burner in the boiler. Thus a fixed draft, equal only to the flue action of the boiler itself, is maintained, regardless of fluctuations in the chimney due to combustion or to atmospheric effects. It is obvious that absolute and relatively high efficiencies can be maintained

This Typical Large Residence where Winters are often Severe is Heated Advantageously by Gas-fired Boilers

where gas automatically is fired at a fixed fuel rate, with a non-fluctuating draft, and with all vital conditions controllable for optimum operation. A uniform seasonal operating efficiency of from 80 to 85 per cent is well within reason, as against from 60 to 65 per cent in an oil-fired boiler and from 35 to 50 per cent where coal is hand-fired. It is for this reason, chiefly, that comparatively high-cost fuel can be used universally, especially where insulation is installed, and other controlling factors in minimizing heat loss from the building are favorable.

Conversion installations are not looked upon with especial favor by gas companies where manufactured gas is to be burned, chiefly because of prejudice based on the woefully inefficient makeshift installations which were common years ago in the natural gas fields. In the New York area, for instance, it probably would be difficult to induce a gas company to make a service connection to such a plant. However, in Baltimore, hundreds of gas burners have been installed in boilers and furnaces with very satisfactory results, many of these having a record of ten or more years of service. The reason lies in the careful study that was made when the house-heating load was first considered. The technique was developed until these conversion installations, as now put in, are almost equal in efficiency to a plant using



The Heating Plant and Domestic Hot Water Plant of the Residence Illustrated

Boiler Originally Using Coal Now Converted for the Use of Gas Fuel

a specific gas-fired boiler. To secure satisfactory results when burning gas in a boiler designed originally for coal, it is necessary to simulate, as far as may be possible, the combustion characteristics of coal. To this end a ring-shaped burner is set on the grates, so that the flame is close to the walls of the combustion chamber. A barrel-shaped form of fire brick is then built up on the grate, almost to the top of the combustion chamber, leaving an annular space for the gas flame. The idea is to heat this mass of brick both by the limited radiation from the inside surface of the flame and by convection, so that the radiation from it will act on the walls of the combustion chamber in a way very like that of a bed of red hot coal. If a rectangular boiler is to be equipped to burn gas, the burner follows the walls, and the fire-brick form also is rectangular. The material increase in efficiency when this plan is carefully followed can easily be demonstrated by running a test before and after putting in the bricking.

Realizing the vast number of house-heating plants of the coal-burning type now in use, and the possibilities for conversion, much experimental work is being done along this line, and it is within reason to say that developments recently brought to a head will make possible conversion installations that will equal, if not surpass, the best gas-fired boilers now available. A boiler or furnace using gas as a domestic fuel can probably be brought as near to perfection, on an efficiency basis, as can any energy-transforming device, and on account of the enormous potential annual consumption, this phase of the matter is occupying the minds of many executives, engineers and research workers. Curiously, the absolute efficiency of a boiler is not an exact criterion of its usefulness in the home. For instance, in determining boiler efficiency the heat radiated from the boiler jacket is charged against the boiler as a loss. This is because it represents heat not available at the boiler outlet, in water or steam. At the same time this heat is manifestly useful, in that it warms the basement, especially the ceiling, which is under the living rooms. Cold floors are not desirable, so the heat marked up as wasted by the boiler does serve a useful purpose. By the same token, at least a portion of the heat in the flue gases is utilized in heating the house, particularly if the chimney is inside. It is only necessary to take the temperatures of the flue gas at the bottom and top of the chimney to determine the useful effect of this so-called waste heat. In a certain research study, where a warm-air furnace was used, the net efficiency of the furnace, as computed, was only slightly over 30 per cent. Yet the net heat lost to the house was less than 40 per cent, and the real efficiency of the heating plant, as rated by the heat actually utilized in the house, was more than twice the calculated furnace efficiency. Taking these things into account, it is not unlikely that gas heating can be accomplished with an efficiency above 90 per cent.

Much of the confusion that has grown up in regard to the rating of coal-fired boilers has, happily, been eliminated in the consideration of gas-fired units. The American Gas Association, realizing the

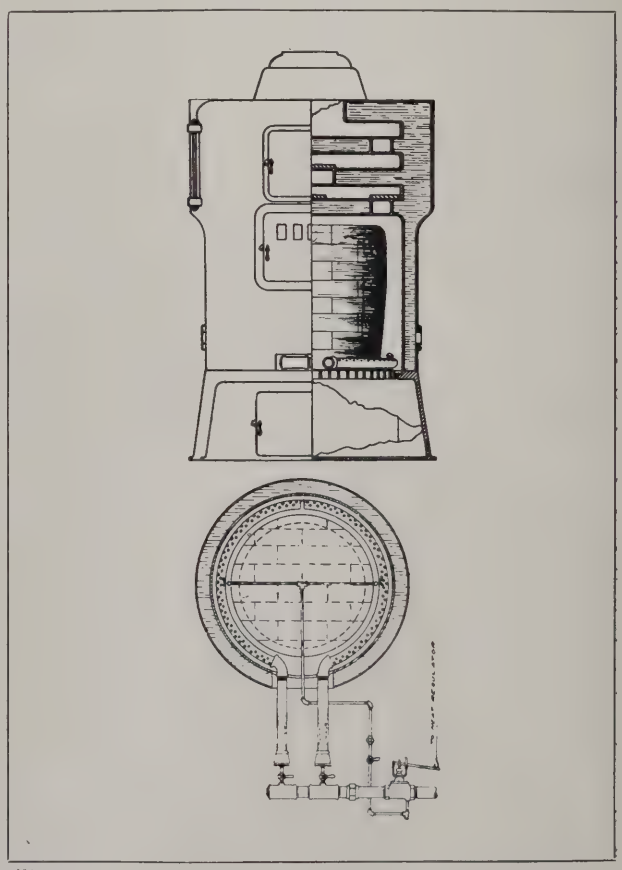


Diagram of a Typical "Conversion" Installation here Described

importance of logical and uniform capacity designations to those responsible for making rating recommendations and selection, as well as to owners, has brought about a logical and uniform scheme of rating, whereby products of manufacturers are tested in the Association's laboratory, and rated in B.t.u. available at the boiler outlet. This procedure removes one of the variables which the architect, heating engineer and contractor are least qualified to determine, and greatly simplifies the selection of a boiler for any purpose.

Two interesting considerations now make gas a desirable fuel for larger and better types of houses. Warm-air heating has, in the past, been used almost entirely for the smaller and cheaper houses, especially those built for speculative purposes. The everyday variety of warm-air installation admittedly has been "cheap,"—little more than a glorified stove with a tin can around it. Many furnace manufacturers were content with this class of market, and little progress was made in a half-century, so far as warm-air engineering was concerned. Less than four years ago leaders in that industry, and prime movers in the National Warm Air Heating and Ventilating Association, decided that some real engineering would be a good thing to stimulate development. So a research residence was built at Urbana, Ill., and since its completion it has been constantly in use as a field laboratory, under the direction of Professor

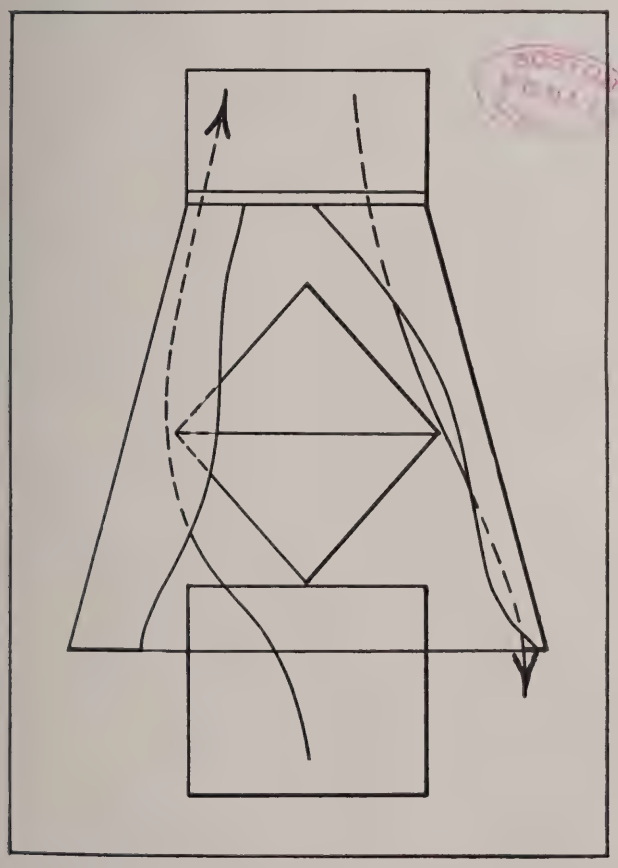
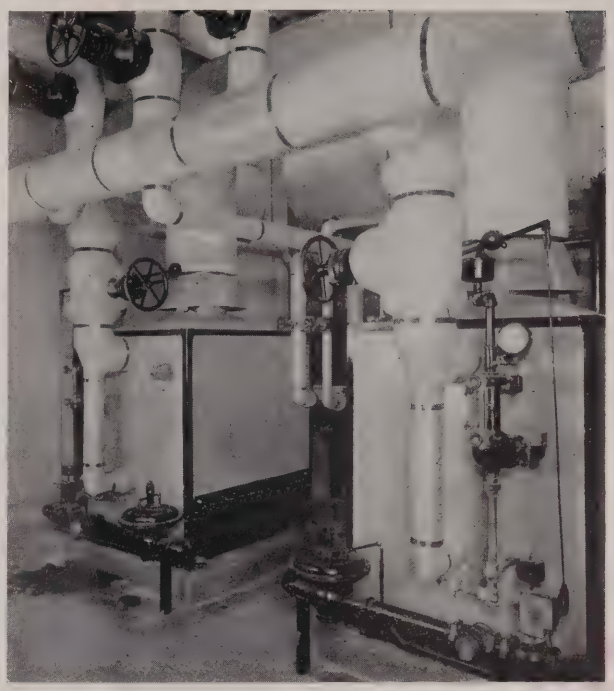


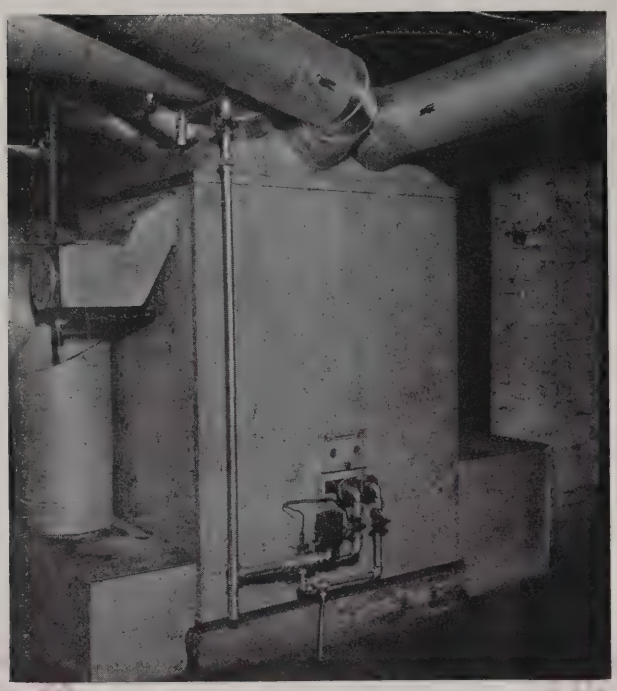
Diagram of the "Draft Breaker" Described on Page 586



A Large Gas-fired Boiler Installation Using Two Boilers for Flexibility

A. C. Willard, of the University of Illinois, assisted by a notable staff of research engineers. Professor Willard has turned out to be the modern Moses of this industry, and more real progress has resulted from the efforts of the director and his staff in three years than was made in the quarter-century preceding. For another influence of vital importance to the development of gas heating we must look to the electric refrigerator, the washing machine and the oil burner. Each of these devices utilizes a small electric motor, usually from 1/10 to 1/4 horse power.

With these two thoughts in mind, let us turn back to a consideration of the possibilities of the gas-fired warm-air furnace. In the first place, warm air is an ideal heating medium because, where it is used directly, and not with steam or water as an interposed medium, it can be properly humidified,—and it is definitely established that proper humidity is an essential to optimum comfort. Not only that, but the proper humidity will keep furniture together for many years, whereas, in a dry atmosphere, it will quickly fall apart. On the other hand warm air, as it has been used in the past, was not a satisfactory heating medium, for the simple reason that its movement to the rooms of a house was dependent upon the natural rise of warm air and the tendency of cold air to settle; such plants were called "gravity" systems. The trouble was that, against infiltration from a cold winter wind, the warm air would not rise to the rooms on the windward side of the house; these rooms "never could be heated." So the desirable features of warm air were more than nullified by the fact that it wouldn't go where it was wanted. Enter, then, the idea of using a little fractional horse-power motor. The motor has been proved



Gas-fired Warm Air Furnace, Showing a Type Frequently Installed on the Pacific Coast

Warm Air Furnace "Conversion" Installation of a Type often used when Natural Gas is Available

reliable by the washing machine, the refrigerator and the oil burner. It would run six to ten or 12 hours a day for an insignificant sum. What could be more simple than to place a fan in the supply duct of the furnace, and to force the flow of air, regardless of infiltration or whatnot? This scheme has been so far developed that residences having as many as 20 rooms and 24 registers have been well heated in the coldest sections of the country. In other words, the market of today for warm-air furnaces is not limited to small houses nor to homes of low cost.

Now introduce gas as the fuel to be burned in one of these modern warm-air furnaces with positive air circulation. This fuel is delivered into the house only as used; considered in this way, it has no appreciable weight. The gas-fired furnace can be built extremely light in weight. It does not, as does the coal-fired boiler, require a 30-foot to 50-foot chimney. Rather, it wants a zero draft. Why should we not, in view of these figurative fingers all pointing the same way, put the gas-fired warm-air heating plant in the attic where it will occupy practically waste space, eliminating the basement altogether, or making it a considerable addition to the livable portion of the house? The objection that "warm air will not flow downward" is silenced by the positive delivery of warm air, by the blower, to any part of the house, up or down. In the summer time a gas-fired refrigerator can be utilized to cool the air that is being circulated through the house. The entire conception is simple, although somewhat striking, merely because it hasn't yet been done.

This, perhaps, is the ultimate in gas "heating." It is not a "pipe dream," because the essentials have been conceived and put into practice by one of the foremost engineers specializing in the field of conditioned air. For over a year nearly a hundred "unit air-conditioning plants" have been in operation in as many homes. The unit for a ten-room house is little larger than an office desk. It is gas-fired, automatically controlled as to heat supply, provides a definite circulation of air that is humidified to just the proper degree, and, in the summer, provides the house with cooled air, dehumidified.

The more general use of gas as a fuel for domestic heating may depend to some extent on the increase in the amount of gas devoted to this use which, in turn, may bring about a lowered price which will enable the owner of a modest home, located within a reasonable range of centers of population, to heat his house with gas economically and automatically.

NEW TREATMENT OF MONOLITHIC EXTERIORS

BY
JOSEPH B. MASON

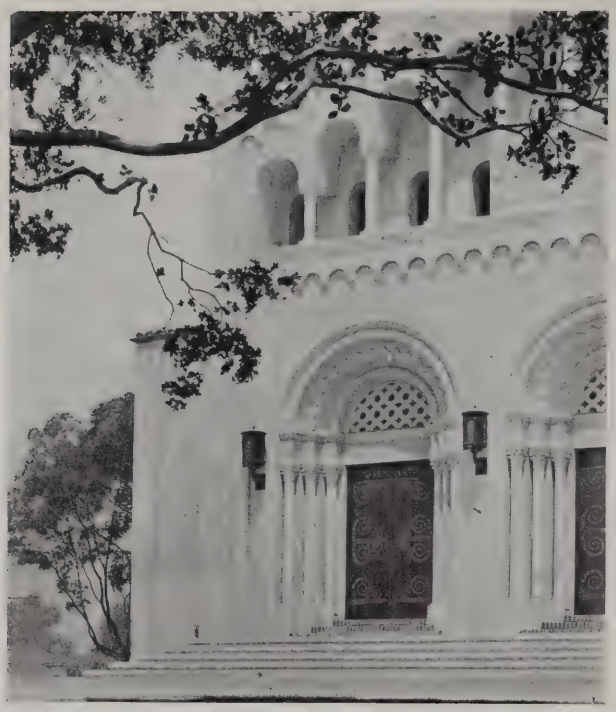
A SURPRISING number of somewhat imposing buildings, including a representative allotment of churches, theaters, lodge buildings, court houses and other public and semi-public structures, have been designed within the last two years in what, for lack of a better term, has been called the "monolithic" style. Possibly it would be more illuminating to say that they have been designed as monolithic structures in which both the architectural and structural requirements have been met with concrete. In these buildings the columns, floors and walls are cast as a unit, the forms being built so as to include practically all of the architectural details and trim as the work progresses. Such buildings are characterized by solid walls, clean cut lines, tall pilasters which carry the eye from the ground to the sky-line, and interesting relief work, which for the most part is cast in place. They have colorful exteriors, achieved through use of stucco and through varied methods of surface treatment of the concrete walls and columns. A technique has been developed to secure attractive surfaces in the monolithic concrete which warrants especial attention. Whether we approve of the design or not, we cannot help feeling keen interest in the new methods employed.

In reinforced concrete the architect has a medium which flows and may be moulded, and through which form appears in gracefully unfolding stages until the final mass stands revealed. The nature of the work demands special care in concrete mixing, since concrete serves as both the structural and facing material. The fact that the concrete is to be exposed to the elements makes it important that unusual care and attention be paid in making and placing it. Contractors should bid on the concrete at a price that will permit this especially careful attention. It is apparent that the old time 1:2:4 concrete mix does not possess the qualities necessary for all this class of work. No rigid mix can wisely be used for many different purposes. The fact that better concrete and concrete that can be adapted to given purposes is being made has had much to do with the development of the monolithic type. Today architects and engineers may demand and obtain concrete that will fulfill their requirements, both structural and architectural, with assurance that it will withstand the elements at least as successfully as any other material to be had within the economic limit of his design. Intelligent and constructive research has checked and re-checked theories of concrete design so thoroughly that concrete can now be made to a definite specification.

Concrete for the exposed walls and columns of the monolithic structure must be of a uniform composition throughout the entire exposed area. Size and grating of the fine and course aggregates should be consistent throughout, so that the class of concrete may be uniform. A water-cement ratio of 6 to 6½ gallons of water to one sack of cement will produce concrete that will resist weathering and prevent the obsorbing of moisture in the walls. Consistency and workability are very important qualities, which must be watched. Concrete should be of such a consistency that it will go into all of the corners of the forms without excessive spading. On the other hand, the mix should not be so wet that after the concrete has been in the forms for 10 or 15 minutes water will rise to the surface. Too liquid a mix will cause the cement paste to work to the surface of the forms, so that when the concrete is exposed, a fatty face with an unpleasant, almost polished, surface of pure cement results. Each batch of concrete should have the aggregate and water measured very carefully, so that the density of every batch will be the same.

In the forming of mouldings, projecting bands, recesses, fluting, etc., it must be constantly borne in mind that everything must be designed for the perfect flow of material. It is important that the concrete be evenly distributed along the form so as not to flow by gravity from the point of discharge to any far point in the wall. The forms should be filled evenly and the concrete, where possible, placed in one continuous operation. Any break in the placing should be made at definite lines along the bottoms of window openings. Inequality of surface and elimination of form markings are not desirable.

In the order of present popularity, the principal methods of treating the concrete exteriors of monolithic buildings are: *first,* stucco; *second,* surfaces with exposed form marks; *third,* grinding and rubbing; *fourth,* special applied finishes. I shall take these up in this order. Stucco exteriors in pure whites, creams and varied colors have been used with success not only on the Pacific coast, where this method of treatment has been widely practiced, but also in other parts of the country. In order to secure a firm bond between the stucco and the monolithic surface, all dirt, grease, oil or other similar matter must be removed. When two- or three-coat stuccoes are employed, it is usually advisable to roughen the surfaces of the concrete before application. This may be done most easily by brushing the surface with wire brushes before the concrete has fully hardened. A special preparation is now obtainable which may be spread on the interior surfaces of forms and which will retard the hardening of the cement mortar at the surface. It may then be easily roughened by brushing. A good bond is also dependent upon good suction. A concrete



Portland Cement Plaster on Monolithic Walls. Doorway Ornament of Pre-cast Stone
John Galen Howard & Associates, Architects

saturated with water will have practically no suction; pure or dry concrete will probably have too much.

A single coat of stucco which improves the coarse appearance of the surface of the concrete but which does not completely obscure the form marks is used very often and with considerable success. A mixture made in the proportion of 1 cubic foot of Portland cement to 2 cubic feet of sand has proved very satisfactory when just sufficient water has been added to make a mortar of creamy consistency. This mixture is dashed on the concrete surface with a stiff brush and allowed to harden without troweling. Two- and three-coat stuccoes are used to achieve surface effect beyond the possibilities of the single-coat. Various trowel effects are possible, or the exterior stucco coat may be marked off in the pattern of stones. Some of the most unique effects have been achieved by combing stuccoed surfaces with a stiff wire brush. An interesting effect is obtained by combing alternate blocks at right angles to the horizontal. Commercial Portland cement stuccoes containing, where color is used, thoroughly tested mineral pigment, are recommended. The colors of stuccoes can be controlled very closely.

Probably the most interesting, because of the boldness of the experiment, has been the practice of leaving the monolithic surfaces just as they come from the forms, with no further surface treatment. Without entering into the merits of this procedure, it is sufficient to say that it has been used to produce a number of striking and interesting structures and is worthy of consideration. Surfaces that are to be left as they come from the forms must of course be detailed carefully. Good quality lumber and boards of uniform width, well finished, must be specified for the forms. Careful study should be made to determine the proper widths of form boards to be used. Wide boards tend to make the

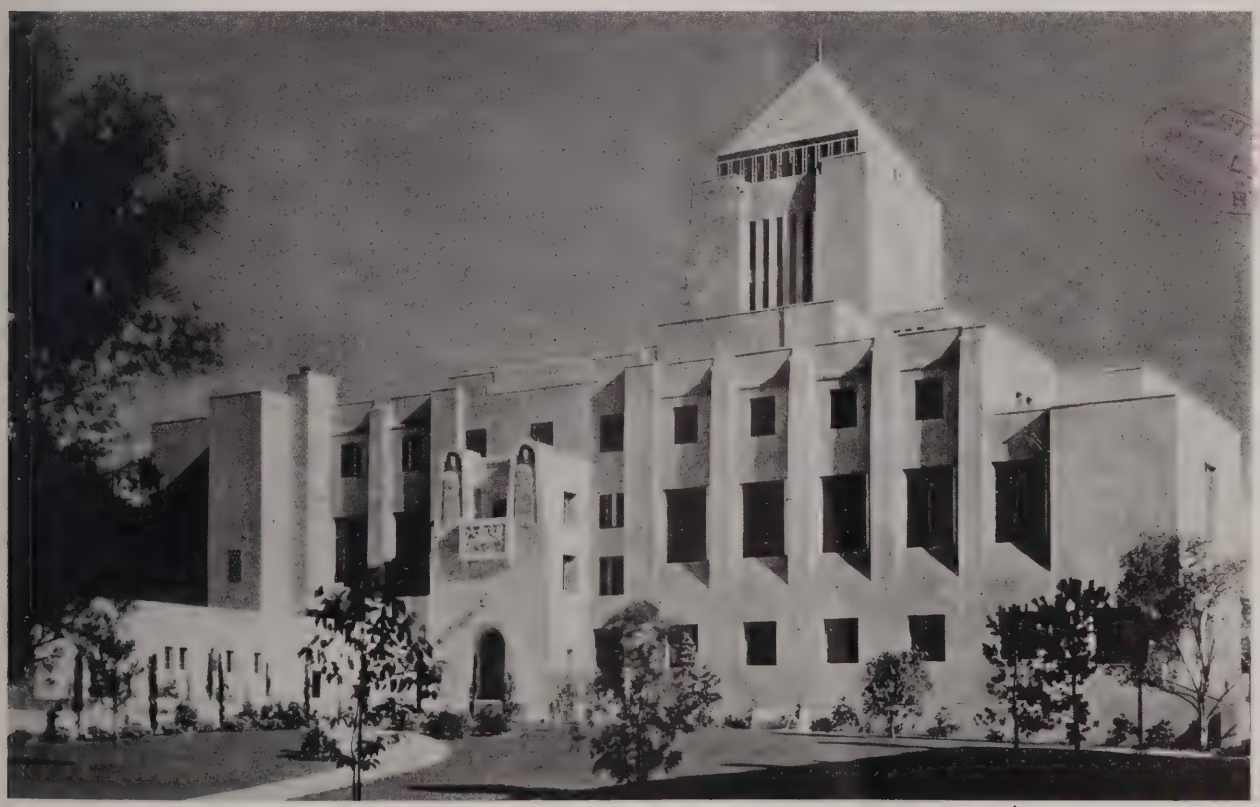
Monolithic Concrete with Cast Stone and Colored Stucco Exterior
George Applegarth, Architect

structure look heavy and clumsy, while narrow boards warp the design. The form boards must be leveled and carried entirely around the building at the proper elevation, and joints should be so broken that they will not be conspicuous.

Some surface treatment with a portable grinding outfit or carborundum wheel is often made. The grinding should not remove all of the form marks, but should merely even the surface, giving it a more pleasing appearance without destroying the textural effect. The extent to which grinding or rubbing of the hardened concrete surface is carried forward will depend upon the effect desired. Many structures which have proved very attractive received only slight rubbing with a carborundum stone after application of a cement wash. Again, to achieve the desired effect, more intensive rubbing or grinding of the entire surface is often carried out. Bush hammering and other air-tooling treatments of concrete surfaces are in general use over panels and small border areas. Concrete of good quality may be tooled with success, and this provides an interesting variation in the surface treatment. Exposed aggregate surfaces offer interesting possibilities. A surface material made up of specially colored aggregates is applied either as stucco or by casting and applying to the surface of the wall. After this facing material has been applied and allowed to harden, the aggregates are exposed by washing with diluted muriatic acid. This method produces concrete that is very hard and durable and yet permits the carrying out of even the most minute details.

Monolithic Concrete with Rough Concrete Finish
F. Pierpont & Walter S. Davis, Architects

One of the advantages of using the monolithic concrete type is that decorations or embellishments can be cast as integral parts of the walls. Reverse plaster or wooden moulds are built into the forms as they are erected, and are filled with the concrete that is used in the rest of the structure.



Reinforced Concrete Walls with Light Buff Stucco Exterior
Bertram Grosvenor Goodhue, Architect; Carleton Monroe Winslow, Associated

Monolithic Concrete with White Portland Cement Stucco Exterior
Derrick Hubert, Architect

Portland Cement Stucco and Cast Stone Trim and Ornament
L. L. Dongan, Architect

Brush Coat of Cream Colored Stucco Trimmed with Cast Stone and Sgraffito
Allison & Allison, Architects

Light Chocolate Colored Stucco Exterior over Reinforced Concrete
Curlett & Beelman, Architects

ARCHITECTURAL USE OF LIME

BY
J. J. HURLEY
CONSTRUCTION ENGINEER

IT is well known that modern structures require lime in some form or another, and for certain purposes for which no other material is "just as good." Lime putty is probably the "stickiest" and "slipperiest" cementitious material known. For this reason lime putty sticks where it it put, and as many would say, "it puts very easily." Every variety of lime has its architectural use, but the number of kinds of lime that may be used for each architectural purpose is very small.

First of all, just what *is* lime? It is the product obtained by heating limestone to its dissociation temperature (1600° to 2100° Fahr.) under such conditions that the carbon dioxide and other volatile matter are expelled. Lime consists primarily of calcium oxide, but may contain magnesium oxide, which in some limes may range in amounts as high as 45 per cent. Small amounts of alumina, ferric oxide and silica, and traces of other impurities are frequently present. The suitability of lime for any particular use depends on its chemical composition and its physical properties. It is here that the architect is forced to depend on established and reputable lime manufacturers to guide him in specifying the kind of lime for the purpose in mind.

History. Lime was probably the first cementitious binder used by man. The technique and practice of its use have been developed by centuries of experiment and observation. The fact that many architectural gems have come down to us from ancient days, and that they have resisted the ravages of the elements for centuries, bears eloquent testimony to lime's lasting qualities and integrity. Lime was first used because of the fact that it hardens from a soft, smooth, easily handled paste into a dense, hard mass. Brick, stone or other building units laid in it are bound together into monolithic, durable structures. The structural details and natural roughness of the construction units can be masked by spreading lime mortar over them in the form of plaster, thus giving a pleasing and hygienic surface.

Any lime manufacturer of recognized standing can be depended upon not to recommend the lime he makes to be used for a purpose for which it is not suitable. It is especially important that the instructions issued by the manufacturer regarding the slaking of the lime he manufactures be followed and emphasized by the architect in his specifications. With some lime it is necessary in slaking it *to pour the water on the lime.* With other lime, of different chemical and physical composition, it is necessary *to put the water in the box and to dump the lime into the water.* All of this is necessary in order to obtain the best results, and it is obvious that the architect cannot be expected to know these things unless he has had long experience with the particular brands of lime used in any special given instance.

Specifications. Unless it is wished to confine the kind of brand of lime used to one special make, it is suggested that these short specifications be used: "The lime (quicklime or hydrated lime) shall meet the current standard specifications of the American Society for Testing Materials and shall be used in accordance with the manufacturer's printed instructions. The brand of lime shall be approved by the architect." Modern methods have been applied to the manufacture of lime by the more progressive lime manufacturers. They have been quick to make use of the valuable research work done by the United States Bureau of Standards. The Bureau is the authority for the statement "that any good lump lime pulverized and passed through a 50-mesh screen *can be guaranteed not to pit or pop.*" This is the reason why at least one of the largest lime manufacturers in the country advertises that one of his brands is *"guaranteed not to pit"* when used for plastering. Pulverized lime has many advantages for the architect, when guaranteed by a reputable manufacturer. When made as directed by the United States Bureau of Standards, the architect does not have to wait for the lime putty to age for from two to eight weeks, as is necessary with lump quicklime putty, or hydrated lime. Putty made from pulverized quicklime so manufactured may be used with perfect safety as soon as it is cold.

The modern manufacturing process of making lime is in accord with exact chemical science in which experienced chemists are regularly employed, and in which mechanical engineers, civil engineers, and geologists are also on the regular payrolls. The modern lime plant is a most interesting place. Everywhere one sees motors, conveyors made of steel pans for handling hot lime, labor-saving devices of all kinds, electrical recording pyrometers for keeping track of the heat of the kilns; modern automatic gas producers; automatic coal-handling machinery for handling coal from cars or barges; barrel plants where wood barrels are turned out complete, almost without human hands touching them; electrical, steam, and gasolene locomotives and all-steel cars for hauling both limerock and the finished product to where they are needed,—and in fact all of the up-to-the-minute appliances of big business.

Hydrated Lime. This lime is a very important architectural material, and it is demanding its increasing place in the architect's mind. Hydrated lime is quicklime with its chemical appetite for water satisfied. It is produced in this way. The lump quicklime to be hydrated is crushed, and then conveyed mechanically to the machine known as the "hydrator." This supplies the quicklime with the proper amount of water to convert it into hydrated

Portion of a Large Lime Quarry

lime of the required chemical and physical properties. Three types of hydrators are used, differing in detail, but all providing for mechanically mixing the quicklime with the necessary water and for conserving the heat of the chemical reaction in sufficient degree to effectively hydrate the quicklime without "burning." The hydrated lime is discharged from the hydrator as a dry white powder. The modern mill uses air-separation units, conveying machinery where air currents carry the hydrated lime to the bins, devices which measure exactly the predetermined amount of water for every pound of quicklime, and last but not least, careful laboratory tests of every batch so as to be sure that the hydrated lime meets the current standard specifications of the American Society for Testing Materials before it is shipped. Hydrated lime and pulverized quicklime are the lime manufacturers' answer to the incessant modern demand for speed.

Kinds of Lime and Hydrated Lime. The "trade," meaning manufacturers, dealers, masons and plasterers, divide lime into these classes:

(1) Common or masons' lime (quicklime), which is usually lump lime, but may be pulverized, and is run-of-kiln lime without any selection. This is the type of lime that is generally used for masonry of a less important nature, bearing light loads, for rough plastering, and for stucco work.

(2) Finishing lime (quicklime) is the best selected lump or pulverized lime made by the manufacturer. It contains a minimum of core and other foreign matter, and is used for the best class of masonry, all grades of plastering, and stucco work. It is more plastic than common lime.

(3) Masons' hydrated lime may be used for scratch and brown coat plastering, for stucco, for masonry mortars, and as an admixture to Portland cement concrete.

(4) Finishing hydrated lime may be used for any purpose for which masons' hydrated lime may be used, and in addition, it may be used as an ingredient for the final or white coat of plaster. Finishing hydrated lime will have a plasticity figure of 200 or more on the Emley plasticmeter, all as outlined in the American Society for Testing Materials Tentative Methods of Sampling, Inspection, Packing and Marking of Lime Products. The Federal Specifications Board has Master Specifications covering lime of all kinds, both quicklime and hydrated lime, which are essentially the same as the "Standards" published by the American Society for Testing Materials. There are 38 varieties of limestone listed by Knibbs, which run from alabaster, through chalk and marble to travertine. Marble is perhaps the purest high calcium limestone that we know today.

Modern Stucco. The architect is much interested today in stucco. The economy of its construction, its durability of surface, fire resistance, low maintenance cost, its use in improvement and repair of unsightly or old surfaces, and the pleasing artistic effects possible with stucco, all find favor with the architect, and with his client as well. The term "stucco," which was formerly used in referring to ornamental plasterwork, whether interior or exterior, is now confined to exterior plastering, either plain or ornamental. Stucco may be defined as a material used in a plastic state to form a hard coating for exterior walls or surfaces. Stucco is a mixture of one or more cementitious materials with sand or other fillers, and with or without other materials such as hair, fiber and coloring matter. Lime stucco is a mixture of properly prepared lime putty or paste, sand and water, with or without the addition of a small percentage of cement. Hair or fiber may be added to assist in forming the "key," depending on the style and character of the background. Coloring matter may be added to obtain the desired tone, although most satisfactory color effects are obtained through the use of selected sands. Different colored (fine or coarse) aggregates may be used for obtaining various effects of colors and surface textures. There are many fine examples of the architectural use of lime stucco in the older states, both of New England and the South, especially in Charleston, S. C., and the missions of California. New Orleans must also be mentioned, as the French influence is most noticeable in the stucco on homes and churches in that fine old city. The economy of lime stucco is due to a number of factors. The ability of lime putty to carry a large amount of sand makes possible a leaner mix, which authorities agree is the best in

stucco work. The high plasticity enables the plasterer to apply lime stucco easily, to spread it with little effort, and to work it thoroughly. Freedom from cracks is one of the special merits of lime stucco. A. H. White, an authority on stucco, says: "Freedom from initial hair cracks can be secured only by using a lean mixture, not richer that 1 part of cementing material to 3 parts of sand by volume." The manner in which lime stucco hardens prevents the formation of cracks. It hardens slowly enough, due to evaporation of the water and recarbonation of the lime, to permit the lath to which it is applied to adjust itself. Where other backing, such as masonry, is used, there is no movement. While the freshly applied stucco expands and contracts with moisture changes, the fully hardened stucco shows little change, since it will consist of porous bodies in greater or less degree. Waterproofing is unnecessary in properly proportioned, mixed and applied lime stucco. Stucco will absorb in rainy weather,—but this is not injurious. The density of lime stucco corresponds closely with mortar used for masonry.

Plastering. Plastering involves perhaps the most important architectural use of lime. It is used to shut out drafts, to make for more privacy, and to make dwellings and other structures more sanitary and beautiful. It also affords some protection against fire. There are two kinds of plastering,—good and bad. As everybody seems to be talking about *good* plastering, it seems to be in order to discuss *bad* plastering,—at least some of its most glaring faults.

Plaster Cracks. In a long and varied experience in a number of states, the writer has seldom heard anyone suggest that the lath or structure itself might be responsible for the cracks, although in over 90 per cent of the cases investigated where severe cracking has been the cause of the complaint, the defects of the structure have been the real reason for the trouble. It must not be supposed that lime plaster does not have defects and cracks which are the fault of the plaster or the way the plaster is applied, for it does. There are map cracks, shrinkage cracks, check cracks, fire cracks, and crazing. There are also the "pitting" and "popping" that, despite the best efforts of the manufacturers and all other persons interested in plastering, will put in their appearance occasionally when unguaranteed lime in lump form is used. All of the defects that can be charged to the plaster can be dismissed from the mind of the architect if a reliable, well established, and experienced plastering contractor does the work, and if a lime that is guaranteed by the manufacturer not to pit or pop is used.

Efflorescence. This defect, sometimes called "blotches," is most difficult to avoid. Sometimes areas of considerable size have the appearance of being wet. They dry out after a while, but they come back intermittently over a long period of time. These blotches are caused by certain salts which are soluble and hygroscopic. As the mixing water evaporates, these salts are brought to the surface and

A Modern Vertical Lime Kiln

deposited. Their hygroscopic property causes them to absorb water from the air, thus keeping the plaster damp. Calcium chloride is one of these salts, and this substance is readily formed by interaction between lime and common salt. This is one reason why sea water or beach sand should not be used for plastering. This is also a reason for not using calcium chloride in the mortar for plastering to reduce the danger of freezing.

The peeling or blistering of paint is almost always due to the presence of water in the plaster. If plaster is painted before it is absolutely dry, trouble may be expected. *Lime or any other type of plaster should not be painted in less than three months from the time the finished plaster is applied, and then only if the plaster is dry.* Paint sometimes "burns" when applied over plaster. Free lime, oxide or hydroxide, will destroy linseed oil, causing the paint film to become brittle. One may expect to find free lime in all green (damp, or wet, newly applied) plasters, whether they be lime, gypsum or cement. If it is not desirable to wait for the free lime to become inert through carbonation, a priming coat may be used. This coat should be prepared by dissolving three pounds of zinc sulphate in a gallon of water. The zinc sulphate reacts with the lime to produce compounds which have no effect on oil. Cold water paint may be used without taking this precaution. All architects want good plastering, because plaster is about two-thirds of the area visible in the usual

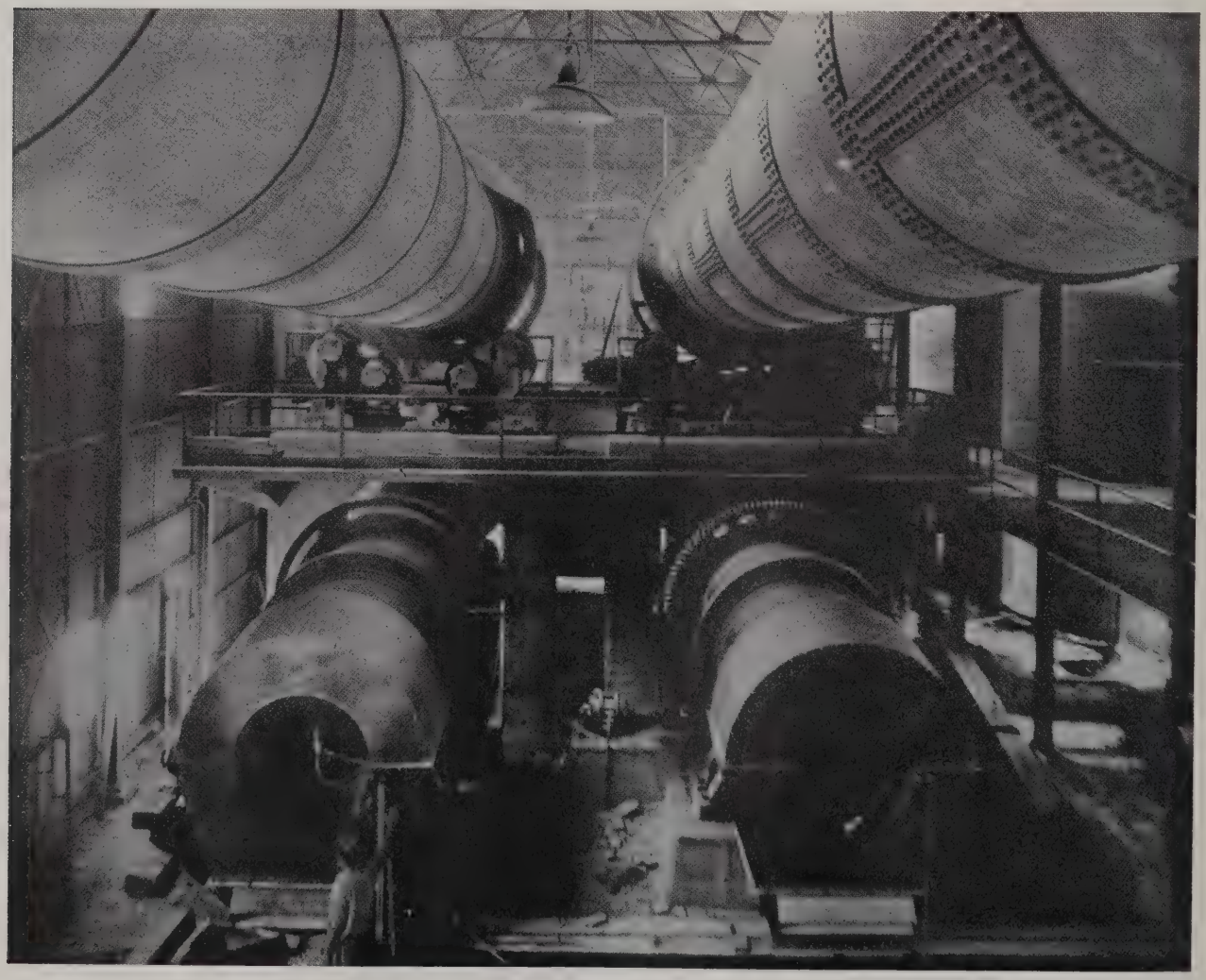
room. The plaster should make and continue to give a good impression over a long term of years. This is not possible if the architect permits, for any reason, inferior work. One-coat plaster work is to be especially condemned.

Two-coat Plaster. Two-coat lime plaster on wood or metal lath, when properly done, will give satisfaction. This is especially true if the under coat is put on in two parts and brought out to grounds and well darbied and straightened, and then floated down properly with a wooden float after the plaster has stiffened, but before it is dry. This floating operation is very important, for it fills up all the shrinkage cracks and leaves a mechanically roughened surface for the finish or "skim" coat. The so-called "Boston skim coat," when applied by an experienced plasterer, is a most satisfactory finish over doubled-up, two-coat lime plaster. Boston skim is made of clean, sharp sand and lime putty in about equal parts and troweled to a smooth, hard surface.

Three-coat Work. This represents the proper use of lime plaster, the first or scratch coat being applied and allowed to become absolutely dry before the second or brown boat is applied. The brown coat is also allowed to dry before the finish coat is applied. All this is true, no matter to what kind of lath or masonry backing the plaster is applied. Plastering often seems to be a good detail on which to save money in cutting the cost of a structure, but for the architect's peace of mind, it would be much better to save on some other item, for nothing comes under the observation of owners and tenants quite as constantly as plaster.

The American Institute of Architects in collaboration with the National Lime Association has prepared standard specifications for lime plaster, copies of which can be had by an architect if he will apply to any lime manufacturer, or to the National Lime Association, at Washington. The United States Bureau of Standards is responsible for the statement that in the presence of moisture (and all plaster is subject to exposure to moisture at one time or another), lime plaster preserves metal lath from rusting. This is so because lime has an alkaline reaction. On the other hand, there are some so-called "patent plasters" to be had that have an acid reaction.

Mortar for Brick and Other Masonry. The function of mortar in laying up brick, stone, tile, etc., is twofold. It must provide a smooth bed upon which the building units may be easily laid, and it



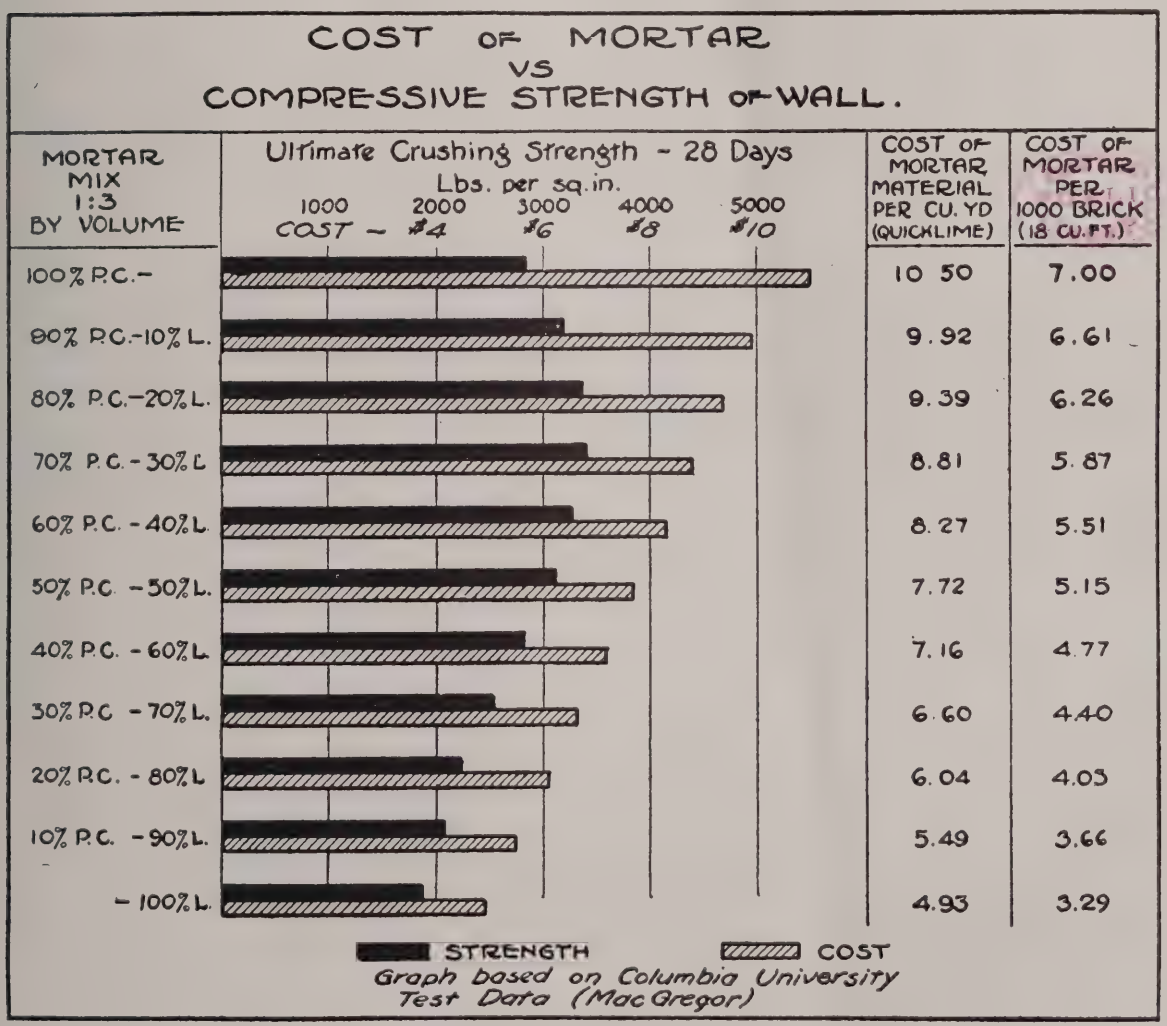
A Modern Horizontal Revolving Drum Lime Burning Kiln

must bind them together into a permanent mass. From the architect's point of view, it is necessary, in addition, to prevent the entrance of rain, wind, and cold through the spaces between the building units, which must be entirely filled with mortar. It is necessary that the mortar develop a safe compressive strength to resist the load on the lowest mortar bed, and also develop sufficient cohesive and adhesive strength to properly hold the building units in their places while the mortar is attaining its initial strength. The mortar must also finally pass the tests of durability and density. In all these qualities lime mortar or "1:1:6" mortar (made of 1 part by volume of Portland cement, 1 part by volume of lime putty, and 6 parts by volume of sand) properly used, meets the requirements.

Strength of Lime Mortar. The tests of Prof. McGregor, at Columbia University, will serve as an illustration of the strength of varying mixes of mortar from straight Portland cement to straight lime for the cementitious portion and 3 parts of sand, by volume. The graph included here tells the story, and while the cost figures given do not pretend to be accurate for all portions of the country, they are relatively correct, as a substitution of local prices will show. It will be noted in this graph that the greatest compressive strength is obtained by using 70 per cent of Portland cement and 30 per cent of lime putty. The graph also shows that 50 per cent of Portland cement and 50 per cent of lime putty give almost as great strength as the strongest combination shown; that is, that it gives well over 3,000 pounds per square inch.

Costs. It is impossible to give actual costs on mortar for the whole country, but it is easy to point out that lime putty is the cheapest per cubic foot of any cementitious material used for mortar.

Watertight concrete is concrete through which water cannot pass. "Waterproofed" concrete is concrete to the surface of which some treatment has been applied which may or may not prove permanent, to prevent the entrance of water. Hydrated lime is used in making concrete more "watertight." Because quicklime must be made into putty before it can be used in concrete, and because lime putty does not lend itself well to easily mixing with dry Portland cement, sand and other aggregate, hydrated lime is today universally used and is recommended.



SIMPLIFIED PRACTICE ACHIEVEMENTS IN THE BUILDING AND CONTRUCTION FIELD

BY

RAY M. HUDSON

ASSISTANT DIRECTOR COMMERCIAL STANDARDS GROUP, BUREAU OF STANDARDS

THE high standards of living enjoyed by the American people are the results of steadily mounting *per capita* productivity. Further advances in these standards must be brought about by improving methods and processes, through the elimination of waste in materials and motion in our production and distribution system. Just as 20 years ago we undertook nation-wide conservation of our natural resources, so today we must even more vigorously sustain this campaign for a better utilization of our industrial resources and effort. Wastes in commerce and industry fall into a number of classes. While they are of immediate importance to manufacturing concerns, the business community, and construction engineers, the interests of the general public are involved to an important degree.

In 1921, when the "Hoover Committee on the Elimination of Waste in Industry," made a survey of conditions in six of our major industries, it found that the building industry stood in fourth place, with 53 per cent waste. Thirty-four per cent was chargeable to management. One of the major causes was lack of simplification and standardization in materials, methods, machinery, and so on. When it is remembered that five billion dollars are spent annually in construction, some conception may be gained of the extent to which this loss reduces the country's income. Manufacturers and business men are forced to look into their businesses more intensively than ever before for opportunities to cut down costs and yet maintain for themselves a fair profit. They are finding that a prolific source of waste is using too much variety. A surprising proportion of this variety is made up of slight dimensional differences, of models and types which are not markedly dissimilar, but which were originated in an effort to be "just a little different."

The Department of Commerce, through the Division of Simplified Practice, is assisting the building and construction industry to check this waste, through the reduction of unnecessary variety in sizes and dimensions and other immaterial differences in everyday commodities. This coöperation on the part of the government involves nothing regulatory nor inquisitorial. The service is to help such industrial groups as are interested in reducing waste to get the *facts* as to waste and to put their corrective actions into practice. Safeguards have been set up to protect the fullest development of individual initiative and inventon, as well as to care for the changing trends of business. This is done by providing that the simplified practice recommendations, developed under the auspices of the Division of Simplified Practice, shall be subject to review at the end of such a period as may be fixed by the industry. The re-survey is conducted by a standing committee representative of all factors in the industry, or through another general conference of producers, distributors and organized users. Acceptance by manufacturers, distributors and organized users, representing 80 per cent of the total volume of the industry, is necessary before a program can be published as part of the Elimination of Waste series of the Department of Commerce.

These percentages of reduction in variety have been startling, especially in the application of simplified practice in the building and construction field:

Simplified Practice Report	Items	Reductions From–	To–	Percentage
1	Vitrified Paving Brick.....	66	5	92
3	Metal Lath	125	24	81
7	Rough and Smooth Face Brick..	75	2	97
	Common Brick	44	1	98
8	Range Boilers	130	13	90
12	Hollow Building Tile.....	36	20	44
13	Structural Slates for Plumbing and Sanitary Purposes.....	827	138	83
14	Roofing Slates (descriptive terms, thickness and sizes).....	98	48	51
16	Lumber — Standard Nomenclature Grades and Sizes for Softwood Lumber			
18	Builders' Hardware (items;.....	6948	5130	26
	finishes)	100	29	71
21	Brass Lavatory and Sink Traps..	1114	76	93
25	Hot Water Storage Tanks.....	120	14	88
26	Steel Reinforcing Bars; Cross-sectional Areas	32	11	66
28	Sheet Steel	1819	261	85
29	Eaves Trough and Conductor Pipe	21	16	24
32	Concrete Building Units (length, width and height of blocks, tile, and brick)	115	14	88
38	Sand Lime Brick (length; width; height)	14	3	79
43	Paint and Varnish Brushes.....	480	143	70

Certainly a major contribution to the stability and prosperity of American business is reflected in the savings which industry has gained from simplification. Industrial leaders estimate that these amount in value to more than $500,000,000 a year.

Elimination of 60 per cent of variety in sizes of softwood yard lumber is estimated to have reduced extent of inventories formerly carried by four billion board-feet, thus releasing some $200,000,000 of relatively idle capital. Strict adherence to this lumber simplification assures the home builders of the country the production and distribution of standard dimension lumber supported by the united interests of the industry. During the past year, the lumber simplification program was given even greater impetus through the development of grade marking for cut lumber, on the part of many companies.

FIRE RESISTANCE OF BUILDING MATERIALS AND CONSTRUCTION

BY
S. H. INGBERG
SENIOR ENGINEER, BUREAU OF STANDARDS, WASHINGTON

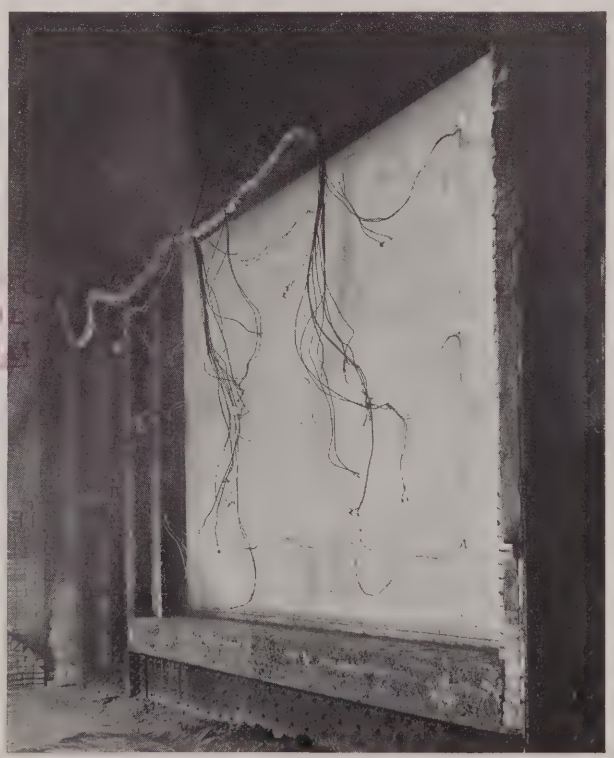
THE fire-resistance activities of the Bureau of Standards have been concerned mainly with research into the fire-resistive properties of materials and members entering into the construction of buildings, the fire hazard of materials constituting the contents of buildings, the severity of fires that can occur with given amounts of combustible building contents, and the protection afforded by devices such as insulated record containers.

Fire-resistance, if in the form of materials incorporated into the building itself, has the advantage of being independent of the human element, upon which fire-prevention of many other kinds must depend. It loses little in effectiveness with age, remaining practically unchanged as long as the structure serves the purpose for which it was built. While general fire-prevention efforts and fire-detective and fire-prevention devices are of value, the building itself must remain as the chief factor in taking care of the margin of danger due to carelessness, ignorance and crime that cannot otherwise be further reduced. Consistent and continuing reduction in life and property loss from fire can be safely premised only on achieving greater fire-resistance of exterior and interior building members, details and finishes, a large gain in which is possible with proper application and combinations of materials now used.

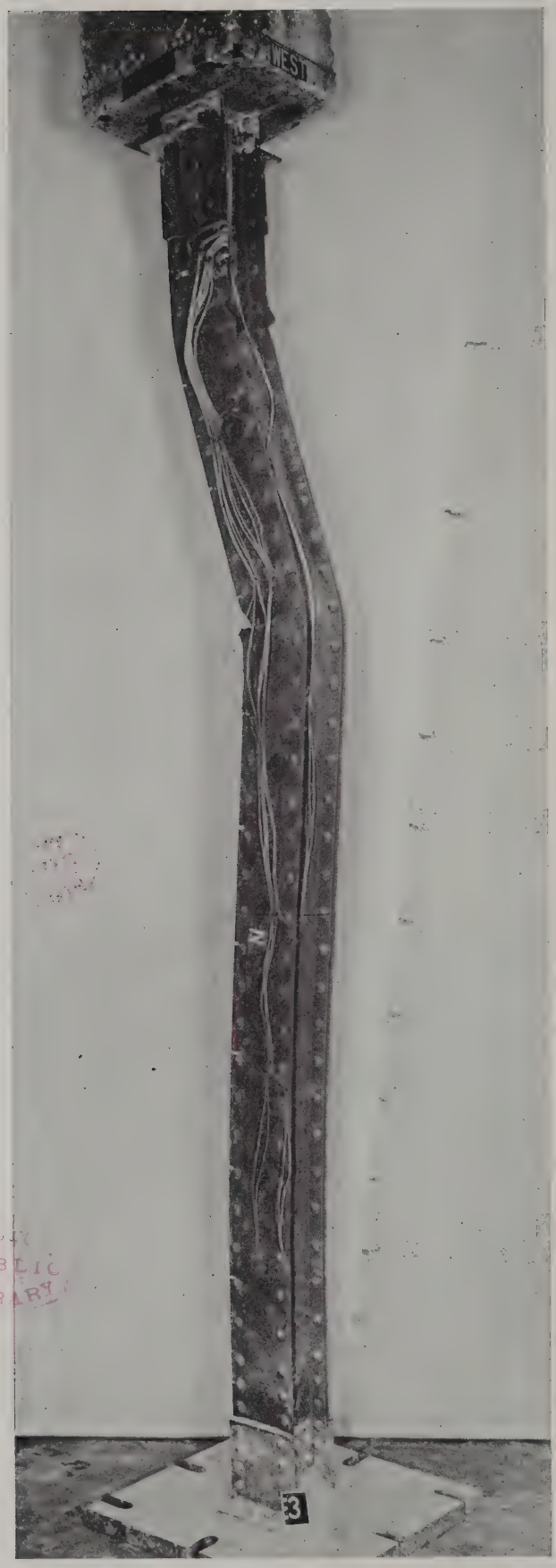
The standard fire test consists in subjecting the material, construction or device to a furnace fire, the intensity of which is regulated so that given average temperatures obtain in the furnace chamber at stated times after the fire is started. By means of this control approximately the same fire exposure can be obtained at different times and in different laboratories. The other requirements will vary with the type of construction or device being tested. Thus, columns are required to support a load approximating what they would carry in a building; floor constructions and bearing walls are similarly required to support loads and also to afford resistance to flame and temperature penetration to an extent that will prevent ignition of materials in contact with the unexposed sides of the walls; incombustible finishes must serve similarly in preventing ignition of the material or construction protected; and insulated containers must preserve their contents. The fire-resistance of the material, construction or device tested is measured by the number of hours and minutes during which these requirements are met in the fire test. Ability to withstand erosion from hose streams, as applied in extinguishing fire, is also required for walls, floors and partitions.

Fire Tests of Building Columns. The initial series of tests undertaken on the basis outlined was

Deck of Prepared Roofing Shingles after Firebrand Tests with Air Currents at Ordinary Temperatures



The Unexposed Side of a Theater Proscenium Curtain Shortly after the Other Side was Exposed to Fire



Typical Failure of Unprotected Steel Column after 11 to 21 Minutes of Fire Exposure

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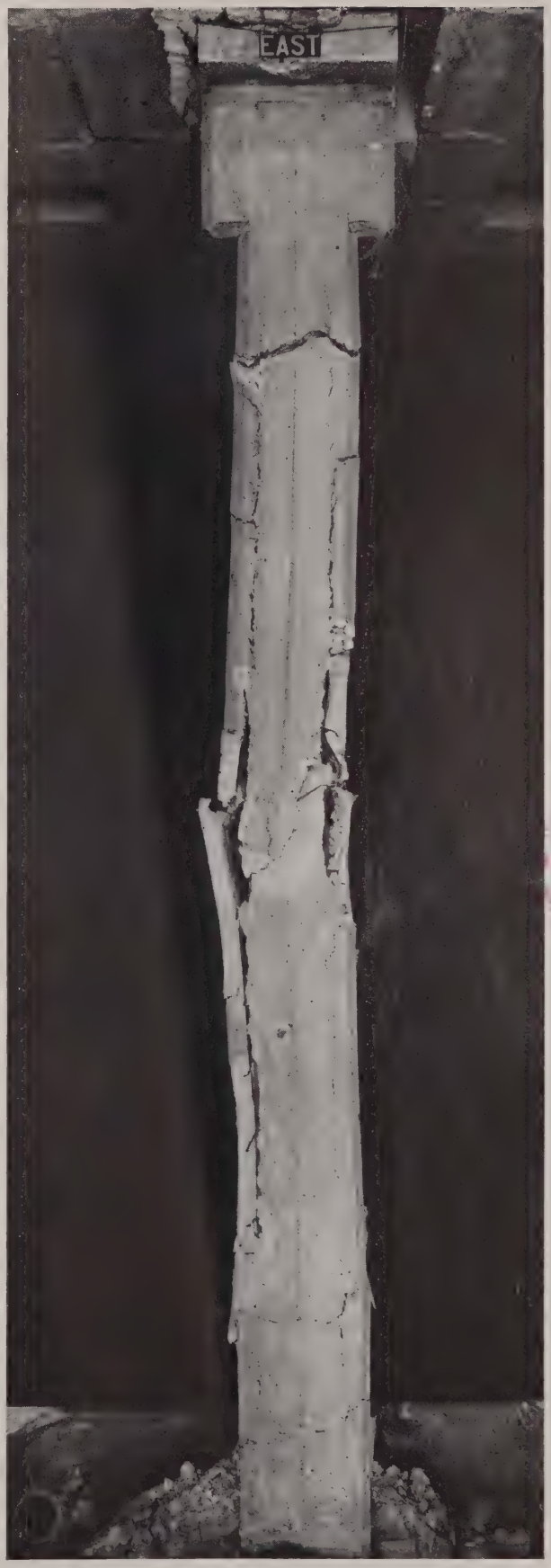
of columns, one series, comprising over 100 tests, being conducted in coöperation with the Associated Factory Mutual and the Underwriters' Laboratories. Typical rolled steel, cast iron, concrete and timber columns were tested unprotected, partly protected and also completely encased in concrete, hollow tile, gypsum block, brick and plaster on metal lath, applied in different thicknesses. The effect of the protection in increasing the fire-resistance of the columns is evident from the fact that unprotected steel columns failed under load in the tests after from 11 to 21 minutes of fire exposure; columns partly protected by filling the interior or reëntrant portions with concrete but with the flanges exposed to fire withstood the test for periods of between 48 minutes and 1 hour, 24 minutes; and columns encased in concrete 2 inches in thickness outside of the metal developed fire-resistance of periods ranging from 1 hour, 47 minutes, to nearly 8 hours. A wide range in effectiveness was found with materials of a given class and applied in the same thickness due to differences in the amount of cracking and similar fire effects sustained. This is evidenced by the range in effectiveness found for 2-inch concrete protection already cited. Similar differences were found for burnt clay products applied as column protection. The results of these tests have been published by the Underwriters' Laboratories, Chicago, as a joint report entitled "Fire Tests of Building Columns," and also by the Bureau of Standards as "Technologic Paper No. 184." The tests deal with a building detail of the greatest importance from the standpoint of maintaining the structural integrity of the building during a fire, and the results are of interest to all concerned with the design or construction.

Fire Tests of Concrete Columns. The other series of column tests was conducted at the former Pittsburgh laboratory of the Bureau of Standards and comprised fire tests of about 60 typical reinforced concrete columns with strength tests of companion columns at room temperatures. Here also a wide range in fire resistance of columns, similar in all respects except for the sand, stone or pebbles used in making the concrete, was noted. Thus columns 18 inches in outside diameter with 1½ inches of concrete over the reinforcing steel failed under working load after from 3 to 4 hours of fire exposure when the concrete was made with siliceous (quartz, chert, granite) sand and pebbles, while with concrete made with broken limestone, trap rock, blast furnace slag or calcareous pebbles, the columns withstood the 4-hour fire test under working load and at its end under loads from 2½ to 3½ times that applied during the test. The difference in performance was determined as due to the mineral composition of the aggregates used, quartz, chert and granite inducing early spalling of the concrete when exposed to fire, while concrete made with limestone, calcareous gravel, trap rock and slag showed few effects of this kind even from very severe fires. It was further shown that a large improvement with the former type of con-

crete can be effected by placing metal mesh in the outer portion of the column to prevent large cracks and dislodgment of cracked portions. Covering or replacing the outer concrete with plaster was also found effective in increasing the fire resistance of the column. The results of these tests have been published by the Bureau of Standards in "Technologic Paper No. 272," entitled "Fire Resistance of Concrete Columns."

Brick Walls. While fire walls of brick have been long recognized as increasing the fire safety of individual buildings as well as decreasing the community hazard from spreading fires, no quantitative measurement of the protection afforded had been made until fire tests of walls, comparable in size to that of a wall panel in a building, were made by the Bureau of Standards. As subjected to the standard fire test, fire resistance periods from about 1 hour for the 4-inch partition to 9 hours or more for solid walls 12 inches thick were developed. Several types of hollow brick walls made by setting a portion or all of the bricks in the wall on edge were also tested, and while the resistances developed were not as high as for solid walls, they indicated adequacy for a considerable range of fire conditions, provided proper wall thicknesses are used. Articles giving summaries of results have been published in several outside journals, and pending publication by the Bureau of Standards, "Letter Circular No. 228," giving results for clay and shale bricks and "No. 229" for concrete and sand lime bricks have been prepared and are available on request.

Hollow Tile Walls. These hollow units of burnt clay vary in size from a unit filling the same space in the wall as two bricks to that of a 12-inch cube. The effects of the fire and the temperature transmission through the wall differ considerably from what obtains for the relatively smaller and solid brick units. The rapid increase in the use of hollow tile as a wall material prompted inquiry as to its fire-resistive properties, and the Bureau was requested to undertake tests of typical wall constructions. The first series consisted of fire exposure tests under load of piers built of tile of typical designs made from representative clays. A wide difference in fire effects was noted, ascribable mainly to differences in the mineral composition of the clay and to a less extent to the design of the unit. A further series of tests of small walls was undertaken to ascertain the effect of certain changes in raw material, manufacturing details and design. In this as in other portions of the work, coöperation with the industry was had through the Hollow Building Tile Association. The final series consisted of about 170 fire tests and fire and water tests of typical hollow tile wall constructions, 8 to 16 inches in thickness, tested (1) bare, (2) plastered or stuccoed, (3) furred and plastered, or (4) faced with brick. Depending on the shape of the unit and the clay from which it was made, fire resistance of from 1½ to 3 hours obtained for unplastered 8-inch walls,



Steel Columns Protected by 2 Inches of Concrete Withstood Fire Test for Periods up to Almost 8 Hours

from 3 to 6 hours for 12-inch walls, and from 4 to 12 hours for 16-inch walls. Tile with the greatest number of cells or webs through the wall thickness was found to give the highest fire-resistance. Plaster was found to add 1 hour or more to these periods and also to decrease the fire damage. Plaster applied on split furring gave protection to the load-bearing portion of the wall to such an extent that very little damage resulted from fires of from 4 to 6 hours' duration.

The final report, giving results of all tests made, has been submitted for publication as a Bureau of Standards "Technologic Paper." It is believed that the fire-resistance of this relatively new type of wall construction has been ascertained and defined in all essential respects by these tests.

Theater Proscenium Curtains. Many disastrous fires in theaters have shown the need for a dependable movable partition or curtain for closing the opening between the stage and the auditorium in case a fire originates on the stage. The devices used vary from single-ply asbestos cloth curtains to ponderous steel-framed constructions faced with metal sheets and asbestos boards and weighing, for an ordinary opening, ten tons or more. A number of operation and fire tests were made of the different types in the Bureau's large wall furnace. The heavy constructions, properly installed, were found to be satisfactory from the operation standpoint and to keep back smoke and glow from an intense fire on the stage side for periods of ½ hour. The single asbestos cloth curtains hung between a top and a bottom pipe batten were found to be unreliable in securing closure of the opening, since drafts such as might be caused by a fire or by ventilating fans caused them to bulge and fail to come down, being held by the friction with the proscenium wall. An improved type of asbestos cloth curtain, consisting of wire-reinforced cloth applied on each side of a pipe or structural steel framework, was also tested. This can be hung so that it will be reliable in operation, and in the fire test it was found to prevent smoke and glow from showing on the auditorium side for 15 minutes. This affords time for exit from the auditorium, with a considerable margin of safety. Pending publication of the results, "Letter Circular No. 137" has been prepared and can be obtained on request. It gives a summary of results, recommended specifications for proscenium curtains, and suggestions for improving existing installations.

Fire Tests of Roofing Materials. In efforts to decrease the community fire hazard, most municipalities impose restrictions on the kind of roofing materials permitted within city limits or in certain portions thereof. The scope of such restrictive measures has occasioned much dispute, and at the request of organizations representing producers and users of roofing materials, a comprehensive series of tests of the fire-resistance of all prepared roofing materials in ordinary use was undertaken and was completed during the present year. This has included tests of new and weathered wood shingles, and asphalt prepared roll roofing and shingles, slate, asbestos, metal and tile roofings. Tests have also been made of painted and chemically treated wood shingles, both new and after exposure to the weather

Interior of Small House Simulating Office Occupancy, before Fire Test

for periods of up to 12 years. Specimens of weathered wood shingle roofs covered with asphalt prepared roll roofing and shingles or with paint coatings have also been tested. For the combustible roofings, the fire-resistance of the weathered roofings was generally considerably below that of the newly applied materials, although some forms of asphalt roofings showed little decrease in fire-resistance after weather exposures of up to 12 years. Results of the tests also emphasize the general superiority from the fire-resistance standpoint of incombustible roofing materials, such as slate, cement-asbestos, clay and concrete tile, and metal. The results of the tests are being prepared for publication in the Bureau of Standards technologic series. Copies of a preliminary report, giving the results of tests with new roofings, have been supplied to the officials of a number of cities who requested them in connection with the adoption of roofing ordinances.

Strength of Materials at High Temperatures. In connection with fire tests of building construction, it is often important to know the strength and elastic properties of the constituent materials at the pertaining temperatures. An equipment with which good temperature uniformity and control are obtainable has been in use during the past three years. Tests with structural steel and cast iron have been completed. A paper ("Compressive Strength and Deformation of Structural Steel and Cast Iron Shapes at Temperatures up to 950°C," Proceedings of American Society for Testing Materials, Vol. 26, Part II, pp. 33-51, 1926) giving results with structural shapes has been published. To this there was added a series of tests for obtaining information on effect of length, which has also been completed.

Severity of Building Fires. In order that protection requirements, such as those for structural members, wall openings and record containers, be placed on a definite basis, it is necessary to be able to make reliable estimates of the severity of fires that can arise with typical constructions and occupancies involving given amounts of combustible materials per unit of floor area. This severity would have to be interpreted as equivalent to so many hours of the standard fire test, the fire-resistance of the protections, constructions and devices to be used being measured by this standard.

Since the data obtained from actual fires are inconclusive as it concerns temperatures developed and the length of time they prevailed, some burning-out tests have been conducted in one-story, fire-resistive buildings erected for the purpose, one being 15 by 29 feet and another 30 by 60 feet in plan. These buildings were fitted with old furniture and records to represent light, commercial and record storage occupancies, the weight of the combustible contents ranging from 13 to 55 pounds per square foot. Further extension of this work to other typical occupancies is contemplated in order that the effect of any difference due to the character of the combustible materials involved may be had. The results so far obtained indicate the possibility of establishing by this means a basis for applying materials, constructions and devices as resistance against fire with as great a degree of safety and economy as they are being applied for other structural purposes.

View During a Fire Intensity Duration Test of Small House Shown Opposite

ADVERTISING ARCHITECTURAL SERVICE

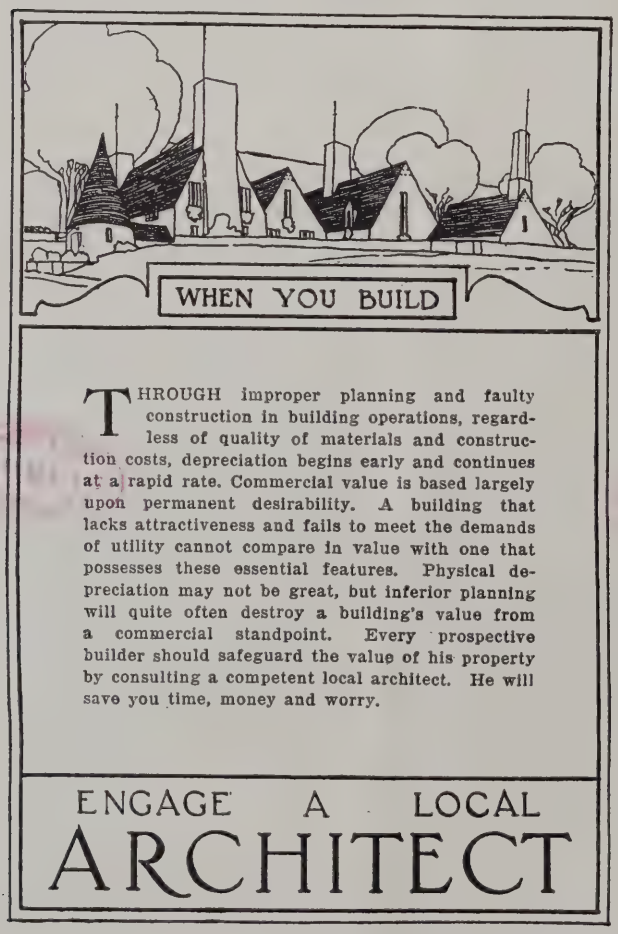
BY

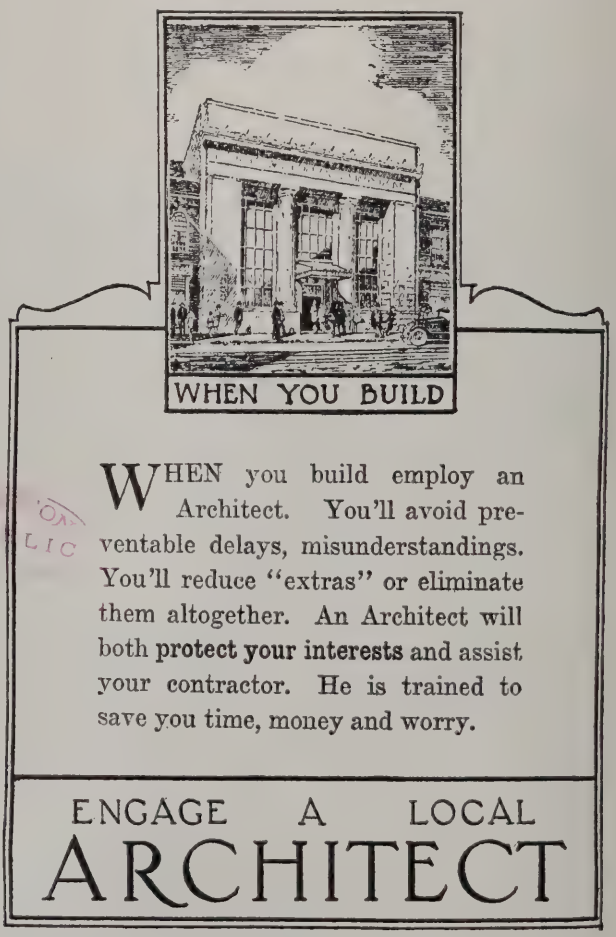
M. NIRDLINGER

THE architectural members of the Architects' Council of the Chamber of Commerce of Pittsburgh recognized the necessity of acquainting the building public with the advantages derived from an architect's services. The question confronting us was how these messages could best be presented.

After many weeks of discussion, it was decided to first determine the extent to which the local architects would financially support an advertising campaign. To ascertain this it was necessary to make a general canvass among the architects. This was accomplished, and results showed a generous response which assured us of the success of the undertaking. After careful consideration of several mediums, the committee decided on newspaper advertising. We entered into a contract with a local morning paper for display advertising on Thursday of each week.

Notwithstanding the limited space possible in the first year's campaign, we succeeded in interesting the public, and received many favorable comments which proved the wisdom of our activity. We traced many direct and indirect advantages to the profession from this concerted action. Architects discontinued some of their private advertising that was without merit, and the saving was far greater than their share of our mass advertising. Due to our activity, we are receiving most friendly coöperation from the daily press. We are brought into closer contact with one another, this being most helpful in creating good fellowship. We are now recognized as business men instead of dreamers, especially by the business men of our city. This in itself removes a long recognized barrier that has stood between the practical business man and the professional man. We are showing our fellow citizen the folly of trying to secure good architecture without an architect. We are also convincing him that he cannot obtain reproduction of gems he has found in the larger cities unless he permits us the same liberty and freedom that were given the architect in the larger city. We are convincing our fellow citizen also that the service of a local architect is his best investment. It is not our intention to try to reach the men or corporations associated with important structures, since they are as a rule our clients already; but it is the small man and the small estate, corporation, etc., preparing to build.





Two of the Advertisements used by the Pittsburgh Architects
(Size as published in newspapers, approximately 4 by 6 inches)

AN OPPORTUNITY FOR ARCHITECTS

THE REVISION OF THE NEW YORK TENEMENT HOUSE LAW

BY
ARTHUR C. HOLDEN, ARCHITECT

IT has been said that opportunity does not go around wearing a label. Some even contend there is no such thing as opportunity at all, but that opportunity is a way of looking at things. The man of genius will see an opportunity in an apparently usual situation, whereas the ordinary man would pass it by. There are many men in the architectural profession who have genius, though some of them are handicapped by preconceived notions of what an architect should do and how an architect should act. A kind of self-consciousness is a handicap to genius.

There is an opportunity now which lies open to the architectural profession. The Tenement House Law of New York is up for revision. Happily, under the American constitutional system, when one state takes a step in advance, it is possible for other states to go further. Two winters ago the legislature created a Temporary Commission to Examine and Revise the Tenement House Law. Last January the Commission brought in its first report. The architects announced that since they had not had time to study the proposed law, they could not take a position either favoring or opposing it. Several months of controversy followed, and the legislature adjourned without taking action other than to enlarge the Commission and to continue it for another year. A new report will be brought in to the next legislature. Last summer was spent in further investigation by sub-committees and in conferences with civic, social and technical bodies.

The present Tenement House Law has been amended 150 times since its passage in 1901. It is due for a thoroughgoing revision. Its original passage was made necessary by the shocking revelations of the comprehensive report of the Tenement House Commission of 1900. It was the social service organizations, not the architects, who sponsored the legislation. The law was designed to restrain unscrupulous promoters from putting up buildings which were unsafe from the point of view of egress in case of fire and unhealthy because of the lack of proper light and ventilation or because of insufficient provision of sanitary equipment. The immediate purpose of the law was to protect the poorest class of people and to prevent their exploitation by overcrowding in inadequate and unsanitary quarters. The Tenement House Law is, in consequence, a law replete with "prohibitions and minimum requirements."

Since the time of the law's passage New York has doubled in population and assessed realty values have increased amazingly,—from $3,357,224,369 in 1900 to $14,738,806,010 in 1928,—exclusive of the Borough of Richmond. The value of the dollar has been cut in half, and methods of building have been revolutionized. We have just begun to look upon housing as an industry requiring very nice balancing of the art of design, the science of construction, and the economics of housing finance. At the time the present Commission was called into being, economic pressure was working havoc with the enforcement of the law. In all classes of dwellings methods for evading the law had become so well defined that they were reflected in property values. The old definition of a tenement house as a "building occupied by three or more families, living independently of each other and doing their own cooking," exempted from the requirements of the law any building in which theoretically not more than two families did their own cooking, no matter how many families lived in the building. On expensive land it was possible to run a towering skyscraper with practically no courts to provide light and air, if only it were called an "apartment hotel" and if the suites were provided with "pantries" instead of "kitchens." Where there existed old fashioned residences in which it was no longer economical for a single family to live, they could be converted into "studio apartments" with inadequate safeguards against fire, provided that no more than two *bona fide* kitchens were put in the same house. Where the price of land appeared cheap, it was possible to build frame houses within 3 feet of each other and to move large sections of the population into jerry-built districts unequipped with sewers.

In all of the great mass of home building in the United States during the past ten years,—taking it from top to bottom, good, bad and indifferent,—what sort of a role has the architect played? How great has been his influence upon housing construction? Has the architect been a follower or a leader? Of course there are different kinds of architects. A great deal of work is done by a class of men who might be dubbed "archytecks." They make drawings largely for the purpose of "filing" with the various building departments. Their plans show certain essential details, such as the thicknesses of foundation walls, the locations of the houses with respect to building and lot lines, and the plumbing sections. These men also perform the valuable service of getting plans "passed through the department," a labor which requires a great deal of waiting in outer offices, and which the average builder is quite willing to have someone else perform for him. The so-called "high brow" architects are very slightly interested in this class of work. They generally look down upon men whom they call "commercial architects," whose business is drawing out to ¼-inch scale the apartment plans that have been worked out by the real

Typical two-family, semi-detached houses, with courts between, which are not under the jurisdiction of the Tenement House Law. They represent good construction except for the poor lighting in the narrow side courts, which are garage driveways

Rapid depreciation, carrying costs, and economic pressure have forced the subdivision of these frame buildings into apartment suites which are not supposed to contain kitchens. These are typical of conversions made in spite of the Tenement House Law

estate men, and then designing elevations to fit. The latter work under great pressure, and their worry in life is very similar to that which plagues the high brow architect and the "archyteck,"—namely, "where the next commission is to come from."

What architects lack is point of view. I have always felt that conventions of the Institute should be held in a giant Zeppelin, and that not only the high brows but *all* architects should attend. During the reading of the report of the Board of Directors, the airship should be taken on a tour of the United States to let the architects see at first hand the conditions in architecture throughout the nation. Looking down from above, they would see tremendous building activity here and there. Below them there would also lie all the buildings erected in the country since the coming of the Mayflower,—such at least as have survived the ravages of fire, the elements, and the eternal process of rebuilding. I'm sure that the consensus of opinion of such a convention would be that the vast majority of the buildings designed to house the human family were unworthy.

I do not believe that it would be necessary to hold very many aërial conventions before the idea would become firmly planted in the minds of the delegates that there is absolutely no reason in the world why architects should not influence all of the building in the country instead of a very small part of it. There would be a ringing battlecry set up that architects must assume the leadership, that architects must "show how it could be done." From the vantage point of aërial perspective, one can see over mountains and barriers. One learns that some of those things that have appeared to set definite limits to architectural accomplishment can be circumvented. A look at the whole problem in perspective gives the architect a better conception of his task. He learns what it is that has been hampering him. For example, when the architect sees that there is preparation for the revision of any code which regulates building, he recognizes the opportunity to free himself from outworn prohibitions and to protect himself against sub-standard competition.

The over-intensive use of land is one of the evils that, unchecked, threatens to lower the standard of public health and decency. Proper sanitary protection and adequate provision for escape in case of fire are no less essential. The architect is constantly told that he must build economically; that he must not sentimentalize, and that he must keep his design close to the minimum standards of light and air, sanitation and safety allowed by law. The reason given is familiar enough to him. "One cannot afford to do better, because construction costs are so high." But construction costs, as the architect has learned, are not the only costs in producing a building. He has to reckon with the cost of land, which includes the cost of expensive improvements. He has to reckon also with the cost of financing and promotion, which, including sales costs, ranges from 25 cents to over 40 cents on the dollar of cost of the finished housing product. From the vantage point of aërial perspective, the architect would see that by accepting the cost of land and the cost of financing as factors which he is unable to control, he has been compelled with every increase of these costs to either reduce the amount of money available for construction or to crowd his building upon less land than is desirable. Confronted with this dilemma, the architect, assisted by his brother the engineer, has created the skyscraper. By reaching into the upper air above its neighbors, the skyscraper has increased the usable area of the ground on which it stands from 6 to 12 fold, and then to even 20, 30 and 40 fold. The genius of the American architect has been acclaimed around the world. The skyscraper movement, beginning with commercial types, inevitably spread to residential buildings. There is an essential difference, however, in the application. The commercial skyscraper, situated at the mart or business center, maintains its desirability and rentability to a much greater degree than does the residential

Illustration of a typical non-fireproof tenement. On such low value lands it is uneconomical and wasteful to build so intensively. Original rents can be obtained only because of borrowed light and air. The buildings are bound to depreciate when the neighborhood becomes built up

High class apartments built in exclusive residential section originally developed with frame houses on 60-foot lots. The economic unit for the new development is two lots or 120 feet, yet owners insist upon the right to build just as intensively on a 60-foot lot

skyscraper after the neighborhood around it has become built up with similar structures so as to shut off light and air. Business operations can be conducted by artificial light, but so far no one has come forward to urge that homes in which children are brought up are desirable without direct sunlight.

Today in our experience with the 6-story, barracks-like apartments, and, even with the larger 9- and 15-story fireproof buildings, we are experiencing the same tendency to depreciation after the light is shut off as was experienced with the original 6-story, dumb-bell flats erected under the law of 1879. Of course the modern building has not sunk to the low standards of sanitation and health that brought the older buildings into discredit, but the depreciation takes place none the less, and the community pays.

From the architectural observation balloon, skyscrapers,—and in particular residential skyscrapers,—are self-evidently desirable when they are placed alternately with low buildings separating them. It would of course be impossible and inequitable at law to restrict skyscrapers by law to alternate plots of ground. Therefore, the first report of the Commission offered to the legislature in January, 1928, recommended the creation of lot line courts at least 10 feet wide to begin at a point not higher above the street than the width of the street plus 5 feet. This recommendation was the greatest step in advance ever offered for the protection of high value properties against blanketing by abutting lot-line walls. Its provisions were equivalent to a proviso that no skyscraper walls could be carried up nearer to one another than 20 feet, and that in the intervening space no building could be built to a height exceeding the width of the street by more than 5 feet or to a greater depth than 60 feet from the building line. There was a great deal of complaint about this provision on the ground that it worked hardship upon owners of high value property. Such complaint was based on misconception. The Tenement House Law of 1901 limited all walls including lot-line walls to one and one-half times the width of the street. The original recommendations of the Commission permitted greater heights, but required the building to set back away from the property lines so as to protect adjacent property.

Architects are perfectly familiar with the conditions which the skyscraper creates. They know exactly what should be done to make the skyscraper more desirable and to protect it from abuse. Architects are equipped more than any other group to speak for the public good and to say what should and what should not be done. Here is their opportunity to say what good standards should be. If the architects fail in this, and if the advice which they give now is shortsighted, let no architect complain in the future that he can't do better work, that he has to meet the low standards of commercialism. Rapid obsolescence and depreciation are the direct result of low standards, and the architect has had sufficient experience with these to know that the penalty which they exact is high rates of finance, over-rapid amortization, high discounts and more cash in financing and for land, and less cash for construction proper. The architect should be the champion of the people in this. He will find them willing followers, once they realize that to follow him means ultimately securing a more stable building industry and more building for the same rent. Landlords are trained in the rule of thumb, they are not analysts; most of them do not realize what the disorganized state of the housing industry means to them. By following the architects instead of the land peddlers, they can assure themselves more stability of income, for the buildings which they get for the same money will be of higher standards, not subject to such rapid obsolescence and depreciation as at present, and therefore a better and safer investment.

The illustrations given here show some of the common types of houses that have been erected since the war. In the recodification of the law the end sought should be reasonable. In certain fields the abuses

A typical row of recently built frame dwellings. They represent an uneconomic type of construction where full assessment for street opening, paving and sewer will make necessary the ultimate replacement of such housing by a more intensive development

A 3-foot court between frame buildings. An entirely uneconomic system of planning, as the narrowness of the court destroys all usefulness except for the ventilation of bathrooms or stairs. There are types identical with this being built today

have been greater than in others; the purpose should always be stabilization of income and desirability from the tenants' point of view.

In trying to be reasonable, it is necessary to take variations in land values into consideration. Some city land is of such high value that it demands a sky-scraper type of development with all apartments reached by modern, high speed elevators. Medium-priced land, on the other hand, is susceptible to development with lower buildings of the walk-up, non-fireproof type. Cheap land should involve some approximation of rural or suburban conditions. From the point of view of theory, lower-value land does make it possible to design with wider courts and better conditions of light and air; but from the point of view of law, a really desirable standard of court sizes cannot be set, because such standards might be unreasonably restrictive to higher-value property. As a result, where good standards might easily be possible, competition operates to bring all standards down to the level of the most unscrupulous. The first report of the Commission sought to get around this difficulty by setting two standards for court sizes and for bulk of building,—one for high-value and one for low-value lots. Apparently it was a tactical mistake, for this one feature of the report brought opposition from those who claimed to speak for the owners of land. Schooled to think that a permanent "Bull" market for real estate is an economic necessity, they viewed with alarm any restriction at all upon land which would limit its potential development to something less than the limits already attained by other land.

Such a view actually retards improvement, for it begins by discounting possible improvements. The assumption that the land itself will continually increase in value amounts to saying that whatever improvements are made to the land, these improvements must grow rapidly less in value, and that the land will ultimately increase sufficiently in value to offset this rapid depreciation. This is a dangerous philosophy. It ignores the consideration that the basic value of land is derived from the stable income that comes from the land. Any law which in this scientific day and age allows the uneconomical, and unreasonable over-development of land, puts a premium on plunder. The critics of the Commission's proposal to grade the restrictions imposed upon land according to the value of the land, brought in no proposal for a more equitable method. Perhaps, since it is the fools and the "suckers" who continually pay the price of over-rapid depreciation in the form of needlessly high rents, it is outside the province of the law to protect them!

The Commission was also criticized for recommending that all classes of residential buildings should be included under the Dwellings Law. A great deal of misleading information was circulated in order to stir up opposition. Individual owners were told that their homes would be made the subject of tenement inspection in regard to sanitation and cleanliness. It raised incredible alarm. What was really intended was to make it impossible to evade the law on the mere pretense that the building was of a type which did not come within the province of the law. Only by a law which recognizes all types is it possible to encourage the better types, and to put under curb the less desirable types only in cases where abuses have arisen. Whenever a law is drafted in terms that are comprehensive, it is bound to arouse opposition. Such a law cannot be passed (nor could it be enforced, if it were passed) unless it is thoroughly understood. Above all others, the architects are they who should lead in the education of the public. If the architects stand for better types in housing, they will find their leadership irresistible, and the public will give them unqualified support.

SANITARY DESIGN IN MODERN BUILDINGS —COLD WATER SUPPLY

BY
HAROLD L. ALT

THE assurance of a continued water supply at proper pressure is the most important consideration in designing sanitary equipment. While there are many comparatively small installations depending entirely on direct city pressure, the larger buildings almost invariably utilize house tanks. This is because the water reserved in the house tank is usually sufficient to carry over any temporary cut-off of the street supply, and because the use of the tank also insures a constant water pressure on the plumbing fixtures without fluctuation, such as often occurs in the city mains. It will therefore be assumed in this article that a house tank is contemplated. When the tank is made a combined house and fire tank, the capacity is often about 5,000 gallons, which allows a fire reserve of 3,000 gallons and another 2,000 gallons on top of this for building service. These two quantities are prevented from interfering with each other by taking the fire connection off of the bottom of the tank (or from the side near the bottom), and the building supply off the side of the tank three-fifths of the distance up from the bottom of the tank to the water line, as shown in Fig. 1. A 5,000 gallon tank must contain about 700 cubic feet of water, and the sides must carry up about 12 inches above the water line. Thus the dimensions of a 5,000 gallon tank could be 10 feet long by 10 feet wide by 8 feet high. The building supply opening would be on the side three-fifths of 7 feet or 4 feet, 2 inches above the bottom. With the tank full, there is available for fire use the entire contents, but with the tank drained down to the level of the building outlet,—below which it cannot go unless leaving through the fire outlet at the bottom,—there are still 3,000 gallons left for fire service. The piping in such an installation is frequently arranged as shown in Fig. 2. Of course if the fire tank is kept separate from the house tank, the building service would be taken from the bottom of the tank. In some cases the demands of the authorities for water storage are much greater. For instance, in a theater they may insist on 5,000 gallons reserve for sprinklers, 5,000 gallons more for fire standpipes, with whatever amount is desired for house service added to this (usually 2,000 to 3,000 gallons more.) This makes the combined tank capacity between 12,000 and 13,000 gallons.

House tanks must rest on substantial supporting walls or columns, since the weight of such tanks when filled is about 5 tons for each 1,000 gallons. House tanks are usually constructed of steel and are square or rectangular in shape. A middle partition is desirable with duplicate valved pipe connections to each side so that one-half of the tank may be cleaned, painted or repaired without disturbing the water in the other half. A curb angle about 3 x 3 x ⅜ inch is run around the top to stiffen the edges, and vertical angles about 2 x 2 x ¼ inch or 2½ x 2½ x ¼ inch are used to prevent the sides from bulging. The middle partition ties the two sides together and must be stiffened against pressure in either direction. Under the tank 12-inch to 18-inch I-beams are placed on edge to permit access for painting and repairs. These beams often rest in a drip pan of steel about ⅛ inch thick, the pan projecting 6 inches outside of the tank all around and turned about 3 inches around the edge. A 2-inch drain is run from the drip pan and connected to the tank overflow pipe so that any condensation occurring on the sides of the tank will run down into the drip pan. The pan is supported in turn on a second set of I-beams which are arranged to come directly under the upper tier of beams. A typical steel house tank is illustrated in Fig. 3.

In order to fill the house tank three different sets of conditions must be considered: (a) whether the normal street pressure is sufficient to fill the tank at all times without the use of a pump; (b) whether the city pressure is sufficient to fill the house tank only part of the time, and at other times is inadequate to raise the water into the tank; (c) whether the city pressure seldom, if ever, is sufficient to raise water into the house tank. In the first case, all that is required is a float valve on the tank to shut off the water whenever the tank is full and to open up the supply line whenever the water level in the tank begins to drop. In the second instance, a pump must be used to keep the tank filled during times of low street pressure. This pump should be of centrifugal type so as to allow the water to flow through it up to the tank whenever the street pressure is sufficient; there must be a float control in the tank which will start and stop the motor on the pump whenever the water line fluctuates, and there must be a ball cock on the discharge into the tank so that the street pressure will not overflow the tank continuously whenever it is high enough to force water into the tank. In the third case, any type of pump with float control from the tank will fulfill the needs.

For buildings over 150 feet in height it is advisable to use a system of water supply with two pressures, so that the water pressure in the lower part will not greatly exceed 50 pounds per square inch. A house tank may be installed somewhat above the middle story to supply the lower portion, and a second tank on the roof to supply the upper stories. These tanks may be filled: (a) by using two house pumps, one for each tank; (b) by using one house pump and pumping all the water to the upper tank with a pipe from the upper tank to the lower con-

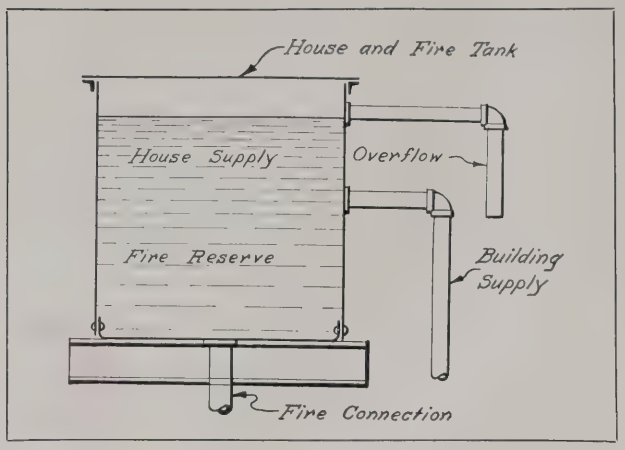


Fig. 1. House Tank, Showing Supply, Overflow and Fire Connections

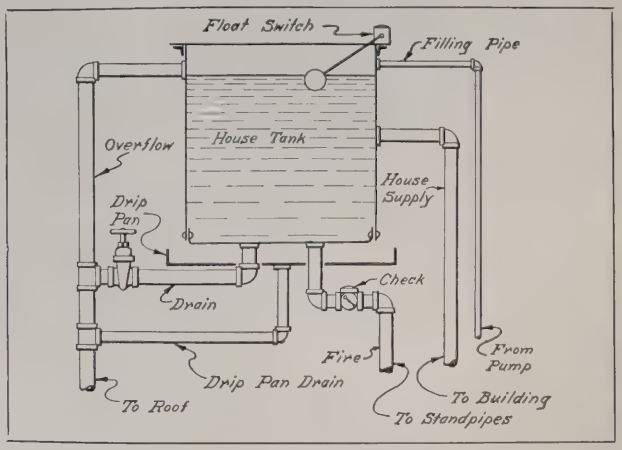


Fig. 2. House Tank, Showing Connections Frequently Employed

trolled by a float valve in the lower tank; (c) by using one house pump to deliver all the water into the lower tank and a booster pump to raise the water for the upper tank from the lower tank level. These three methods will be clearly understood by referring to Figs. 4, 5 and 6. The first method has the objection of requiring four pumps,—two to do the work and two to serve as emergency pumps in case of breakdowns. Owing to the difference in heads on the pumps, it is hardly practical to attempt to use only one pump as a standby. This method does have the advantage of economy in operation, as the water pumped to each level is only the water actually required at that level. In the second method only two pumps are required,—one being a standby,—but all the water required on the lower level must be pumped to the higher level first, and this means a much greater power consumption than in the first scheme. As a substitute for this, the lower tank may be omitted and a pressure-reducing valve placed in the line so as to cut the pressure down to the same pressure as would be obtained with the use of the lower tank. This is illustrated in Fig. 7. The

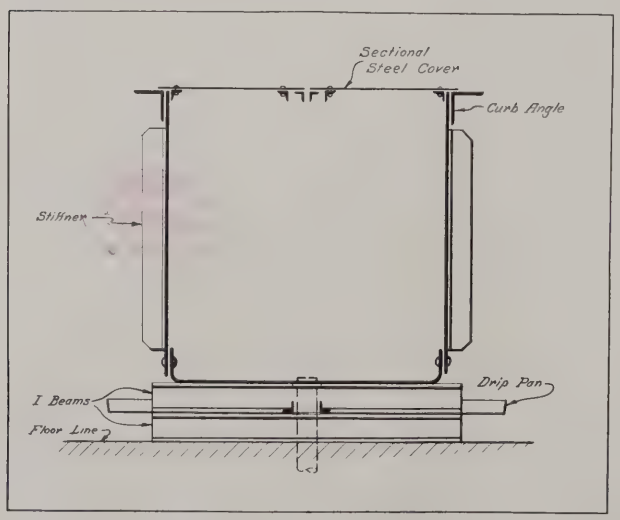


Fig. 3. Typical House Tank Construction

third method also involves use of four pumps, and has the disadvantage of having the pumps far apart. It is seldom used, possibly on account of this drawback.

The Downfeed Cold Water System. With a house tank in the building, this is the most economical method of water distribution. An overhead main is run on or above the ceiling of the top floor, usually in the furred space under the roof, and all cold water lines branch off this main and drop down the side walls or in any other position where they may be required. Branches from this main may be made from a tee turned in any direction, but the most desirable method is shown in Fig. 8. When the construction of the building is such that it does not permit the running of an overhead main, an upfeed system must be employed with the large supply pipe in the basement, and this is the usual method employed in buildings on direct pressure when the water connection from the street enters the basement. Where two pressure systems are in use, an overhead, downfeed system may be used for the upper portion and an upfeed system for the lower portion. This will eliminate horizontal piping and mains in the middle story of the building.

Pipe Sizing. The determining of the necessary cold water pipe sizes for a large installation is a matter of judgment, experience and calculation. Unless some mathematical basis is used, one error may lead to another and seriously affect the whole work. One way to check the diameter of the cold water supply pipe, either main or branch, at any particular point, is to determine the number of fixtures to be supplied and then to take each fixture or group of fixtures and determine what the average load on the line would be. In order to do this, certain factors must be assumed for each fixture according to the size. Thus, fixtures may be divided roughly in this way:

	Factor
(a) Those with ½″ connections (lavatories and sinks)	1
(b) Those with ¾″ connection (sinks, slop sinks, baths)	4
(c) Those with ¾″ to 1″ connection (urinal flush valves)	9
(d) Those with 1″ or 1¼″ connection (w. c. connections)	24

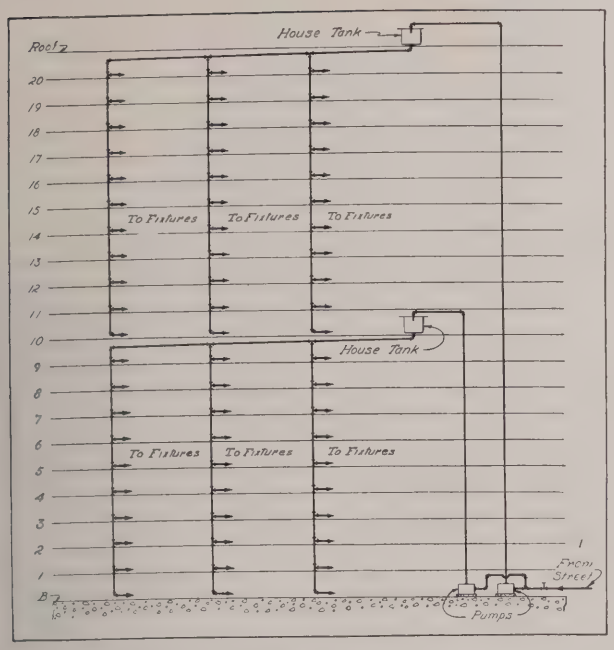


Fig. 4

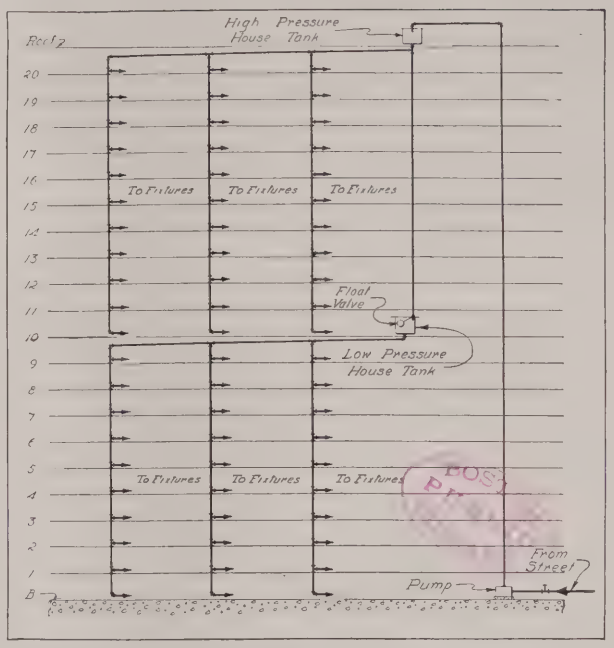


Fig. 5

The sum of all the factors on the line may then be used to determine the pipe size if this sum is first multiplied by a percentage of use based on the percentage of fixtures likely to be turned on at one and the same time.

The various sizes of pipe are also rated in corresponding factors, these being:

Size of Pipe Inches	Factor Allowed
½	6
¾	11
1	17
1¼	30
1½	40
2	66
2½	96
3	148
3½	198
4	254
5	400
6	580
8	1000
10	1600

To apply this system it is still necessary to size the first few fixtures on the branch by judgment, and then to use the factors for determining the sizes of main branches, risers, or supplies. For example, assume five toilet rooms on a riser, each toilet having

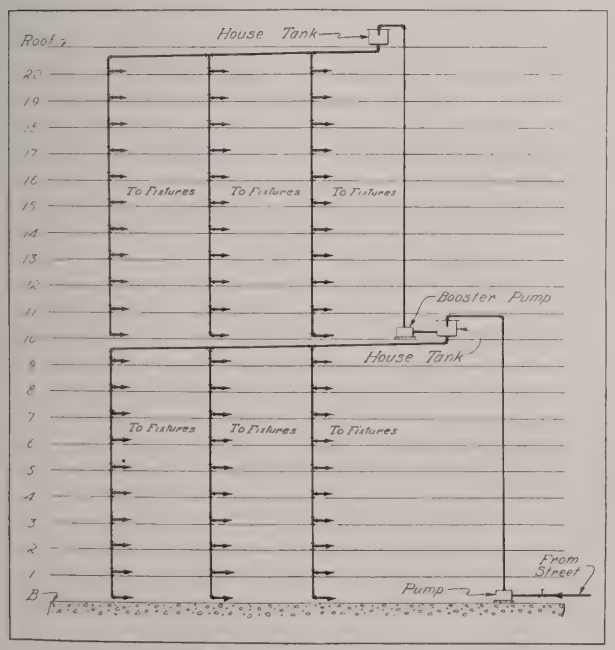


Fig. 6

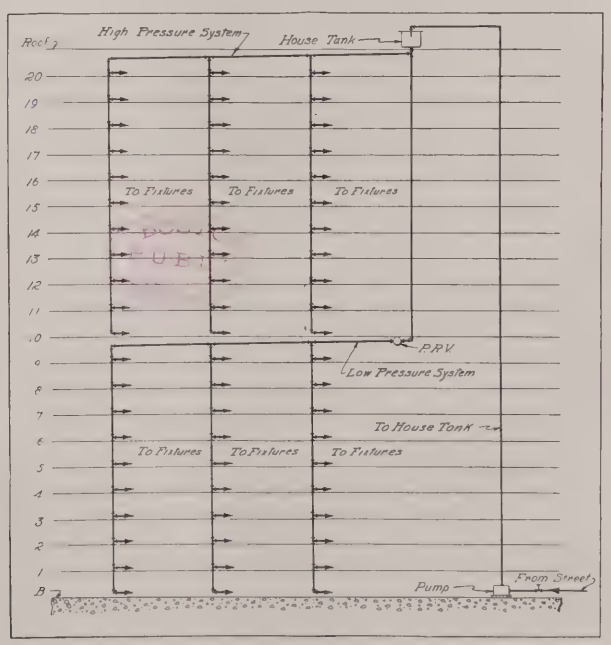


Fig. 7

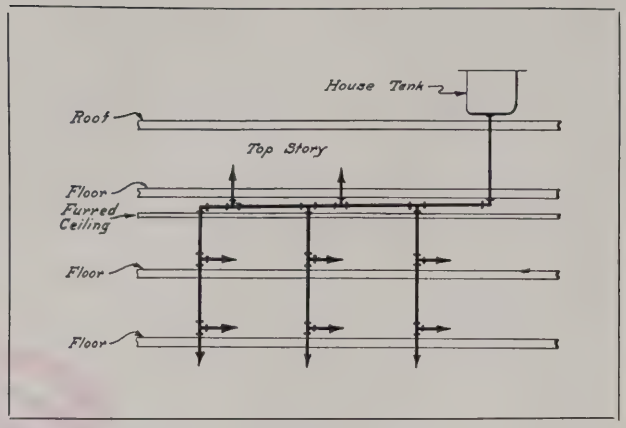


Fig. 8. Method of Connecting Branches of Downfeed System

five flush valve water closets, three flush tank urinals, five lavatories, and one slop sink; what would be the size of the branch to the toilet and what would be the size of the riser?

Fixture	Number	Factor	Equiv. Factor	Percentages of Use	Net Factor
F. v. water closets	5	24	120	40	48
F. t. urinals	3	1	3	33	1
Lavatories	5	5	25	60	15
Slop sink	1	4	4	0	0
Total			152		64

The size of pipe having a higher factor rating than the net factor as computed is 2-inch pipe. It will be noted that the "percentages of use" are based on two water closets out of five being flushed together (or 2/5, which is 40 per cent); one urinal out of three (or 1/3, which is 33 1/3 per cent); three lavatories out of 5 (or 3/5, which is 60 per cent); and that the slop sink is neglected because it is not generally in use when other fixtures are.

Since the branch to the toilet must be 2-inch pipe, the riser size to the top toilet (assuming an upfeed system) must also be 2-inch pipe. But after taking in the second toilet, the riser will begin to have a more equalized load, due to the larger number of fixtures. With a single fixture the size of pipe would have to be based on a "percentage of use" of 100, owing to the fact that when the fixture is turned on it is running at the rate of 100 per cent. But with 1000 fixtures the average use runs only about 33 1/3 per cent because all the fixtures are never turned on at the same instant. As a result of this, the "percentage of use" will constantly recede from 100 and will continuously approach 33 1/3, and, sometimes, be as low as 25 as the number of fixtures is increased. After two toilets are connected to the riser, a total of 26 fixtures is being considered, and this average "percentage of use" should approach the general average of 33⅓ by reducing the "percentage of use" to, say, 40. Then the total sum of equivalent factors (taken at 100 per cent) must be multiplied by 40 to find out the net factor for each toilet and thus multiplied by 2 for two toilets, thus:—

Total equivalent factors,—top toilet.....152
Multiplying by a percentage of 40 per cent equals:

Net factor for each toilet..... 60
Net factor for two toilets.....120
Size of pipe for this factor..... 3 inches

With three toilets the percentage of use could be reduced to, say, 38% giving

$$152 \times 3 \times 38\% = 173 \text{ factor}$$

which requires 3½-inch pipe, and with four toilets and 35% use the result is

$$152 \times 5 \times 33\ 1/3\% \text{ or } 253 \text{ net factor}$$

which also requires 4-inch pipe.

Pneumatic Tank Systems. While pneumatic tanks are seldom used for large buildings, they are sometimes installed in smaller structures and have several advantages. They may be buried with only the heads projecting through the foundation walls, or they may be set in the basements and do not introduce heavy loads at the tops of the buildings. They will give better pressures on the top floor than when a house tank is used unless the house tank is set at a considerable distance above the highest story. They have some serious disadvantages. One of these is a fluctuating pressure on the water line; that is to say when the tank is "pumped up" the pressure is high, and when the tank is "down" or close to the point where refilling must commence, the pressure is low. The less the pressure variation is made, the smaller will be the amount of available water or "storage capacity." The pressure in the tank is due to the air compressed above the water. This air generally occupies about one third of the total tank, as illustrated in Fig. 9, so that this portion of a pneumatic tank can never be used for storage of water and is lost as far as water supply is concerned. But the remaining two thirds, which is filled with water, is seldom all available because before all the water is withdrawn from the pneumatic tank the air has expanded to a point where the air pressure has fallen too low. To overcome this some pneumatic tank manufacturers put an initial air pressure of about 20 pounds, as shown in Fig. 9, on the tank before the water is pumped in. The water is pumped in against this initial air pressure, and the entire amount of water may be withdrawn from the tank before the water pressure (due to the air) falls to 20 pounds. The difficulty encountered in this procedure is that with an initial air pressure of 20 pounds, the quantity of water which may be pumped into the tank without producing excessive pressures is also reduced. In ordinary practice it is customary to decide how much pressure fluctuation it will be safe to permit on the system, and to base the pneumatic tank design on this amount. If it is assumed that 1000 gallons available water storage is desired and that a maximum pressure fluctuation of 20 pounds is permissible, the problem gets down to determining what size of tank will have the air pressure drop 20 pounds when 1000 gallons are withdrawn from it. The size of the tank and

the initial pressure can be easily calculated by the engineer of the tank manufacturer, assuming that the 20 pounds variation will occur between 60 pounds maximum and 40 pounds minimum.

Air Cushions. Every good water supply system has provision made to overcome water hammer and noise in the piping. This danger is minimized and in many cases entirely overcome by (a) employing ample pipe sizes to prevent excessive velocities in the pipes; (b) limiting the maximum pressure under which the water system operates; (c) the judicious and adequate providing of air cushions to absorb the shock of the moving water column when the flow is suddenly stopped. The impact caused by the sudden stoppage of a moving column of water is increased by increasing the velocity, by lengthening the run, by increasing the pressure, or by reducing the pipe size. An air cushion placed at the top of the riser (in a downfeed system) allows the column of water in the riser to shoot up (or down) into the air cushion, which acts to take the impact and bring the pressure to normal. Similar cushions at the end of each branch pipe, formed by turning up the end of the branch a distance of from 12 inches to 18 inches, produce similar results in the branches, and small diameter cushions just back of each fixture are frequently used in first class work. Fig. 10 illustrates a typical pipe installation with the air cushions properly placed.

There are those who argue that air cushions are an unjustified expense because they become water-logged in time and in that condition are no better than if the pipe were "dead ended" in the first place. It is quite true that the water will gradually absorb the air from a cold water air-cushion, making it useless. The air can be replaced by draining the line and then turning the water on again. Water logging does not occur on the hot water line air cushions, as the hot water constantly gives off air and automatically keeps the air cushion properly filled. There has not been offered a better or more practical solution to the water hammer problem than the use of air cushions. Air cushions are usually installed on the branch from the street to protect the meter from damage when the street pressure may be shut off and then turned on again. Another place where a cushion is particularly desirable is on the discharge side of a pressure-reducing valve to prevent noise from opening and closing of the valve.

Valving of Lines. There are three matters to be kept in view when deciding on locations of valves: (a) to locate valves so that various sections of piping may be closed off for repairs or other purposes; (b) to put in as few valves as possible, and to use one valve for as many purposes as possible; (c) to locate all valves in accessible places, so that they may be manipulated without too much difficulty. It is the general practice to place a stop valve on each fixture, particularly when the fixtures are in large groups in first class work. Stop valves are located

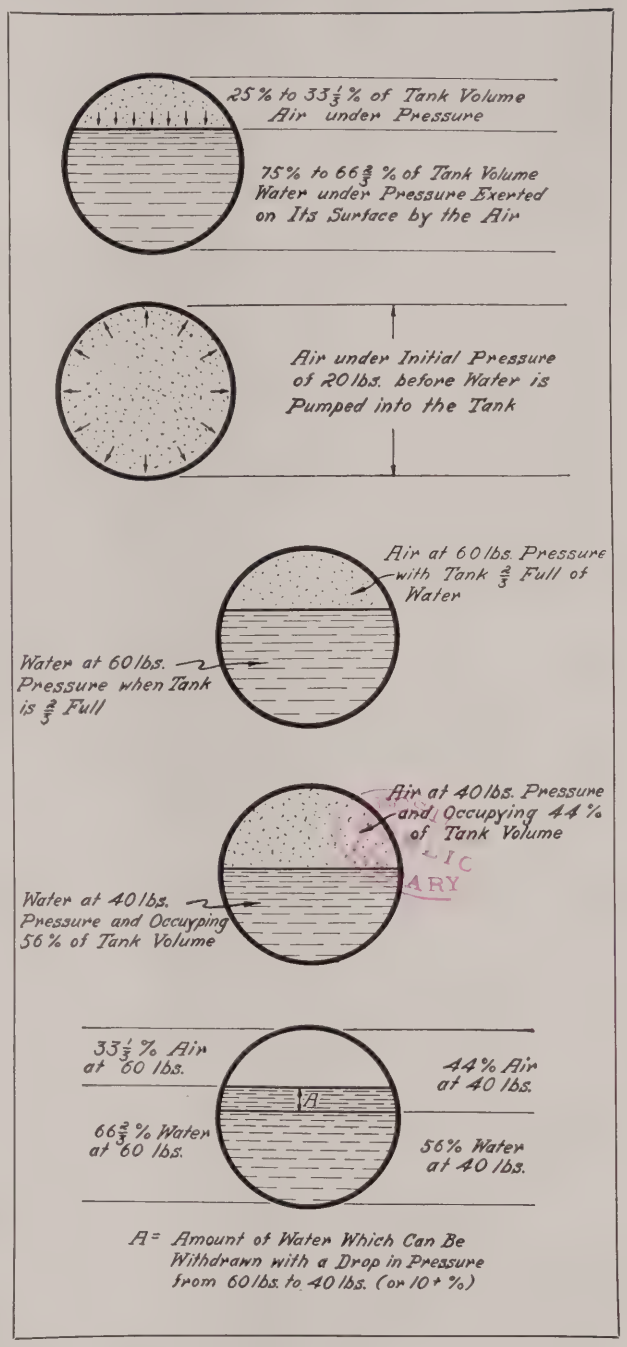


Fig. 9. Pressure and Water Conditions in a Pneumatic Tank

under lavatories, in the vertical supplies to bath tubs, and in the flush valves for water closets and urinals. Slop sinks are usually arranged with valves on the supplies somewhere in the slop closet, or the valves may be omitted on this fixture altogether. Sinks may be valved under the fixture or,—as these fixtures are usually set singly,—on the branch to the fixture. A valve is generally employed on the branch from the riser and is located close to the riser. This valve controls the branch to the toilet room and, consequently, all fixtures on that branch. In cases when the fixture branch only has a few fixtures, such as in the bathrooms of apartment houses or

hotels, it is permissible to omit the fixture valves to save on installation costs. Lavatory stop valves have an advantage in making it possible to regulate the flow from the lavatory faucets to prevent splashing.

The riser itself is usually valved where it leaves the main. This permits cutting off any particular riser in which trouble may develop without affecting any other riser. Frequently the main itself is valved at the various principal branches, but this is often omitted and may be considered as desirable but not absolutely necessary. Of course each piece of apparatus must be valved, and pumps should be valved on both suction and discharge sides, as well as having a check valve placed on the discharge between the stop valve and the pump. Water meters are valved on both sides and are sometimes provided with by-passes. The house tank is valved; the cold water to the hot water heater and the water supply to the boiler are both valved and provided with checks. Wherever a check valve is used, it is highly desirable to have a valve on each side so as to permit opening and examining the check at any time. All valves used on water lines should be of the gate type, owing to the almost negligible amount of resistance which they interpose in the line in comparison to globe valves. Customary practice employs all brass gate valves of from ½- to 2-inch size, and iron body valves, bronze mounted on sizes 2½ inches and over; they are usually of the screw type up to 4 or 6 inches, but are flanged in larger sizes.

Material of Cold Water Pipes. Cold water piping in the best work, and where character of the local water supplied permits, may be made of brass pipe, iron pipe size, or of red brass or red metal. Brass pipe usually contains about 65 per cent copper, while red brass or red metal runs to 85 and sometimes to 88 per cent of copper. There are some localities where the use of brass and red brass pipe is not practical, owing to the characteristics of the local water, and this matter should be carefully investigated. If cost is a consideration, galvanized genuine wrought iron pipe is used with excellent results. Added first cost reduction may be effected by substituting the spellerized pipe on sizes 4 inches and smaller. Above 4-inch pipe, either genuine wrought iron or steel may be used, the steel being somewhat less in price. The all-steel piping is the cheapest, where water analysis permits, and it will answer the purpose for many years. Fittings for cold water pipe are nearly always made of galvanized cast malleable iron, beaded pattern, screwed, up to 6 or 8 inches, and then flanged in larger sizes.

Underground Lines. Where water pipe is run underground and the size is 4-inch or over, regular cast iron water pipe is used, and it is not unusual to raise underground lines of lesser sizes to sizes where cast iron water pipe with calked lead and oakum joints can be employed.

Draw-offs and Drains. It is good practice to provide drains at all low points in the piping system and on risers just beyond the riser stop valve. These drains are nearly always ¾-inch size, with valves having hose threads so that a hose can be coupled on and run to floor drains or pails. To aid in this draining out, it is desirable to pitch all cold water lines back toward the riser, and the riser branches back toward the main, and the main back toward the meter, so that any line may be properly drained.

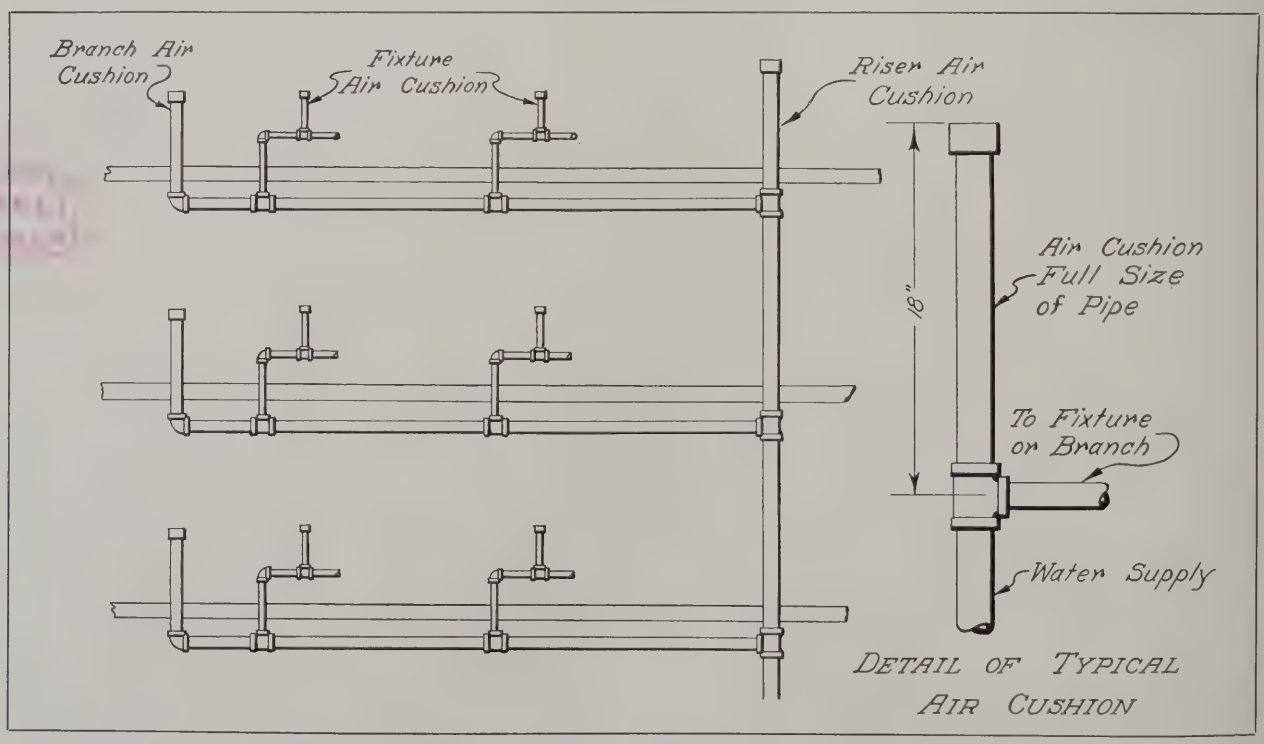


Fig. 10. Typical Air Cushion and Proper Placing of Air Cushions

THE ARCHITECT AS CONSTRUCTOR

PART III—OPERATING A CONSTRUCTION ORGANIZATION

BY
WILFRED W. BEACH

IN preceding articles on this subject, in THE ARCHITECTURAL FORUM for May and August the author discussed the possibility and feasibility of members of the architectural profession attempting to circumvent an apparently increasing tendency of general contractors and constructing engineers to include in their proffered services the functions of the architect. Obviously, the services of an architect are essential to the success of a building, if it be of any consequence. Whether or not the services of the general contractor are likewise, may be considered open to question. If either is to survive to the exclusion of the other, it would seem probable that the individual who creates is most likely to be he who will carry on. But we are facing no such extremity.

The pertinent thing we are presumably facing is the loss of particular commissions to contractors who "furnish plans." If there be owners who prefer this sort of service,—who are convinced that the method is fundamentally sound,—why should it not be the duty of the architect to accommodate them, especially if the architect can convince himself that both client and the architect as builder are to profit considerably thereby? We have therefore shown how it is possible for the architect to acquire new business of this character, and have set forth a contract form to cover an agreement with such a client (THE ARCHITECTURAL FORUM, August, 1928, Part II). The signing of the first of such contracts by the architect should be indicative of his fixed intent to add field construction to the functions of his office. The departure is too comprehensive to be invoked for a single operation, there to deliberately stop. To be sure, he is burning no bridges by the innovation. So long as he guarantees no costs, he is in no way jeopardizing his status as an ethical architect, nor is he necessarily setting himself at loggerheads with the better class of contractors. They may not approve of his entering their fenced preserves, but they will still (most of them) continue to bid on his work when invited, knowing that he will not ask them to waste time figuring on work which is not intended to be let. In other words, one can be both architect and cost-plus builder without encountering insurmountable obstacles.

Having secured the contract, one proceeds to organize the project while working drawings are being completed. One must determine what work is to be sublet and what is to be executed with one's own forces, and must prepare specifications accordingly. It will be found that the duties of the office man in charge of contracts and construction have increased many fold, and that he must be prepared to meet them, whether he be the architect himself or an employe. It may be found advisable to bring in a construction manager from outside if no one in the organization has special fitness for the tasks confronting the office. On the other hand, an architect with inclinations in that direction can readily augment his knowledge of the subject by reference to any one of several up-to-date books on construction methods and management. As work increases, one will add departments of purchasing, expediting, accounting etc., always holding down the overhead to its efficient minimum.

The trades most generally handled through foremen are concrete work, masonry, carpentry, lathing, plastering and painting. General excavating had best be sublet, as a rule, because of the special equipment needed and because men in that line generally know what to do with excavated material. Such a contract should not include the necessary hand-digging of pits and trenches, which can better be handled by common labor under the general foreman or a "straw boss." Piling and deep foundation work, with its necessary shoring, should also be sublet to experienced concerns equipped to do such special work. But by the time the constructing architect is ready to execute large work and heavy construction, he will have gained the necessary preliminary experience and will have found that each commission presents its own problems, beginning with the excavating and continuing through the last detail of the decorating and equipping.

Bids are taken and contracts awarded on the items first needed, as rapidly as drawings and specifications can be issued to bidders. In addition to asking bids of local concerns, if the work be outside a large city, one makes careful canvass of all others available, getting, if possible, three or more bids on each subcontract and material list. The preparation of the latter is, of course, new procedure for the architect. A builder does not hand a set of prints and specifications to a material supply house as he does to a plumber or other subcontractor. Instead, he prepares itemized schedules of lumber, brick and the like, and gets prices accordingly. Contrary to general opinion, there are no standard fixed prices of building materials. There are "list prices" and "quoted prices" and "customary prices,"—and there are also the "prices that are necessary to get the business." Hence the perspicacious purchasing agent. He is quite likely to find that some of the owner's "friends" in the building supply business have had their eyes on this particular project for some time,

and have perhaps been avidly anticipating their profits. In this, as in all other lines of commerce, there are two distinct classes, each intent upon doing the "right thing." But to one, it means the right thing for the *customer,* and to the other the right thing for the *dealer.* To the latter, a legitimate profit means whatever he can get. The purchasing agent must be able to discriminate, as it is up to him to adequately protect the owner against those of his neighbors who are out to gouge him. Furthermore, they would like to be able to show their regular customers that they exacted toll from the outsider. The owner will give his builder a list of those from whom he wants prices,—he may even secure some of the prices himself,—but he should be explicit as to which if any he wishes to have specially favored. Frequently, the association or connection between owner and purveyor is so close that the former especially welcomes the intervention of a purchasing entity to shoulder all responsibility. The construction architect has no axes to grind but can distribute his favors exactly as he and the owner decide is best for the project. They may decide that the ownership of stock or a position on the board of a company does not warrant buying from the incumbent at fat prices, as a local builder might have to do.

As has been intimated, no one individual is more vital to the success of the undertaking than the general foreman. It is to be assumed that he will be chosen with the utmost discrimination. If new to the organization, he will be brought into the office and made thoroughly familiar with its general practice and with the intended procedure in his particular work. He will take time to familiarize himself with the drawings and specifications, material lists and subcontracts. If he is being merely moved from job to job, he can do this in the field. Nevertheless, it is well to give him time between assignments to come into the home office and be checked up,—to get acquainted with his co-workers. It makes *esprit de corps.*

In any event, it is essential that the home office shall have prepared a detailed set of instructions to superintendents or general foremen (as they may be called). Oral advice lacks uniformity, adequacy and force,—leaves too much to the judgment of the individual. He has abundant opportunity to exercise his initiative, even after complying with all home office "red tape." After digesting his instructions, his experience will tell him what is mandatory as well as where he is supposed to "use his head." But, for regular procedure, he should be placed in a position to know what is expected of him without having to ask. If he is the right type of man, he will appreciate printed instructions, even though his previous employers have had nothing of the kind, and any advice may irk him somewhat. Some of the best foremen will put all their energy into pushing the work ahead rapidly and capably but, when it comes to keeping their records and correspondence in shape, they will be beautifully "balled up." They are simply not office men. Foremen of that type should, if big enough, be used on larger work where one or more clerks can be assigned to assist in the time keeping, petty purchasing, receiving, storekeeping, expediting, cost accounting (distributing), and correspondence. It is up to the construction manager to determine how much of such "overhead" the work requires. It is easier to provide too much than not enough. There should be no one in the job office whose time is not fully employed,—crowded. Nothing so demoralizes a field organization as lack of employment. If clerks haven't enough to do to keep them busy, their spare time should be given to such manual labor as can be assigned them. If their white collars are inclined to wilt too much in arduous toil, they may as well get out of the building game before they have wasted too much time at it. This applies to foremen as well. The working foreman who forgets to watch his men while he is working with them may be a poorer investment than he who does nothing but oversee them. The most valuable type is the man who can do both efficiently. Foremen's time goes on whether the work does or not. When interruptions occur and men must be laid off, the good foreman allows nothing to slacken, but pitches in at whatever he can do to lessen the expense of the lull, whether it be for a day or a fortnight.

The drawing up of a set of instructions for the guidance of general foremen should deal with fixed office practice as applicable to the average project. Special conditions demand specific rulings, and no attempt need be made to provide for such exceptions in a formal guide. The instructions included here have been in practical use for some time, being revised as was proved necessary by experience.

1. *The General Foreman's Responsibilities.* The general foreman will act as the representative of the building company on the job and will have entire charge of it under instructions from the home office. He will lay out all the work and superintend all construction and be solely responsible. He will *personally* sign all payrolls, reports, and correspondence.

2. *Drawings and Specifications.* The general foreman will be supplied with as many copies of prints and specifications as may be necessary for his own use and for the use of subcontractors and foremen; he must keep careful record of them, and see that they are not mishandled or mislaid.

3. *Issues and Revisions.* Preliminary prints are sometimes issued for the purpose of starting excavating or foundations before working drawings are completed. When these or later prints are superseded by revised issues, the general foreman shall make careful note of all changes and their effect, if any, on the work already done or laid out, and shall have a distinct understanding with the home office regarding it. He shall also observe due caution that superseded prints are marked "Void" and not left accessible, where they might be subject to misuse.

4. *Checking.* As soon as prints and specifications are received, the general foreman shall carefully review and compare them and check all features in a

general way. He shall then notify the home office that this has been done, calling attention to errors or discrepancies, if any have been noted. This is important and must not be delayed; it may affect later work.

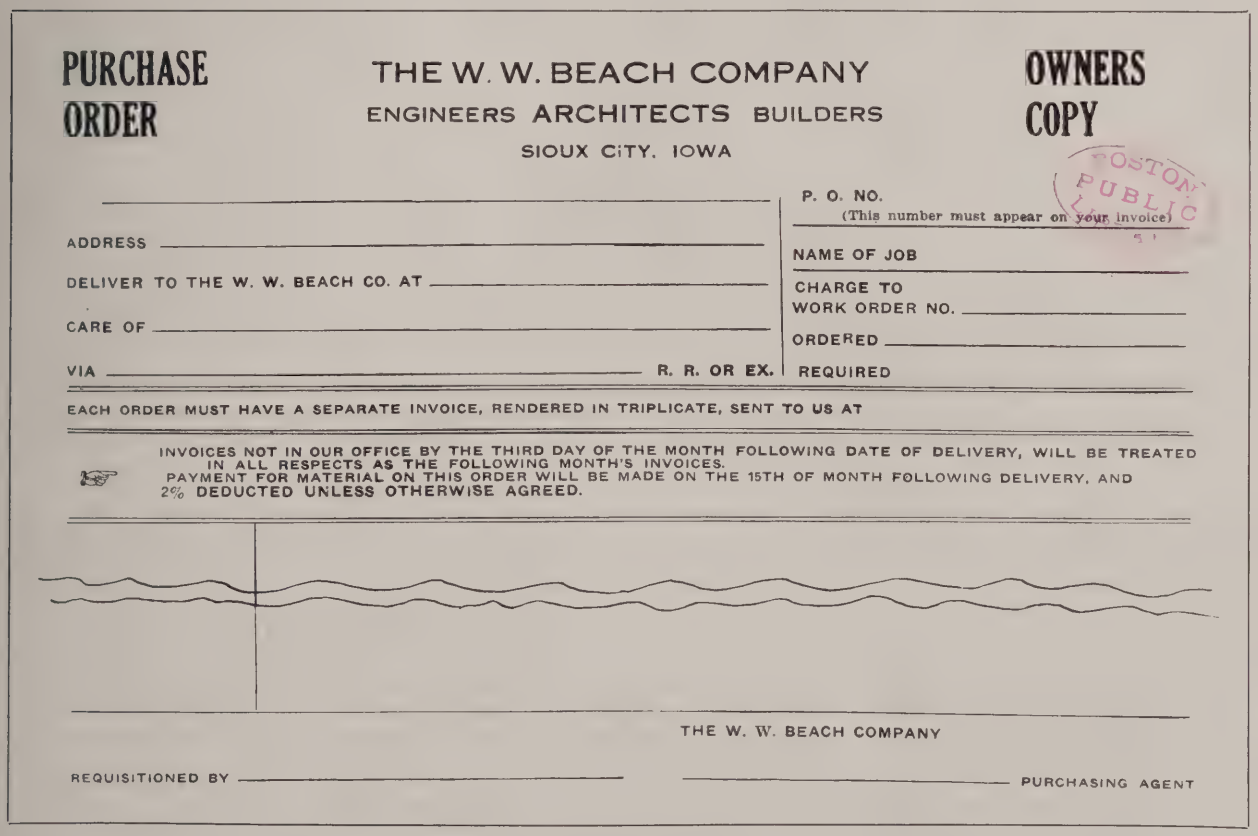
5. *Job Program.* As soon as the construction manager has assigned a general foreman to a project, they will confer and outline a job program, by means of which will be determined the sequence for ordering all materials, dates when they should be ready, and the degree of advancement of the whole work at each fortnightly interval. It shall thereafter be the duty of the general foreman to live up to this program or to show reason for each specific lapse.

6. *General Purchasing.* General purchasing is done through the home office, each order in triplicate;—one to the vendor, one to the general foreman, and one to the home office file. If the owner so requests, a copy is sent him also.

7. *Material Lists.* The general foreman (or such other person as designated by the home office,) will prepare accurate lists of all materials for the work, except such as are included in subcontracts. If not prepared by the general foreman, they must be checked by him and either approved or criticised before being requisitioned. Lists must cover exact materials specified, or else adequate reason be given for variation. They must also state the use of each article listed, the time it is needed at site, how it is to be delivered, and whether quantities given are net or whether allowance is made for waste and shrinkage.

8. *Requisitions and Expediting.* As soon as possible after a project is assigned, program arranged, material listed and checked, the general foreman shall begin requisitioning the home office for material and shall continue doing so in proper time and due sequence until all has been taken care of. Each requisition shall be accompanied by approved material lists, if needed, the number of the purchase order, if one has been issued, and such information as the general foreman has to offer as to the best available source of supply, proper price, etc. He is expected to make all requisitions well ahead of time needed (which shall be stated on requisitions), and to follow up requisitions, not permitting the home office to lose sight of his necessities. Slackness in this particular is much worse than over-insistence. Whereas the general foreman is giving his whole attention to his particular work, he should bear in mind that it is only one of several in the home office, and hence his is the greater responsibility. If he foresees delay in receipt of anything, he should use his best efforts to expedite it or, if beyond his ability to do so, he should ask the home office for special assistance.

9. *Job Purchase Orders.* The general foreman (or the purchasing agent assigned) will make such purchases from local dealers as have been previously arranged for by the construction manager. For all such purchases (except items of less cost than $1, bought out of petty cash) a job purchase order must



PURCHASE ORDER

THE W. W. BEACH COMPANY
ENGINEERS ARCHITECTS BUILDERS
SIOUX CITY, IOWA

OWNERS COPY

BOSTON PUBLIC

P. O. NO.
(This number must appear on your invoice)

ADDRESS _____

NAME OF JOB _____

DELIVER TO THE W. W. BEACH CO. AT _____

CHARGE TO
WORK ORDER NO. _____

CARE OF _____

ORDERED _____

VIA _____ R. R. OR EX.

REQUIRED

EACH ORDER MUST HAVE A SEPARATE INVOICE, RENDERED IN TRIPLICATE, SENT TO US AT

INVOICES NOT IN OUR OFFICE BY THE THIRD DAY OF THE MONTH FOLLOWING DATE OF DELIVERY, WILL BE TREATED IN ALL RESPECTS AS THE FOLLOWING MONTH'S INVOICES.
PAYMENT FOR MATERIAL ON THIS ORDER WILL BE MADE ON THE 15TH OF MONTH FOLLOWING DELIVERY, AND 2% DEDUCTED UNLESS OTHERWISE AGREED.

THE W. W. BEACH COMPANY

REQUISITIONED BY _____

_____ PURCHASING AGENT

Fac-simile of Purchase Order Blank
(Original size 8½ by 11 inches)

be written beforehand in quadruplicate. If it is a cash item, one copy goes to job file and three to home office, each receipted by vendor (in place of an invoice). For items to be charged, the original of the four copies shall be given to vendor. Only such charge accounts should be opened as seem absolutely necessary, favoring such dealers as the owner prefers or as make best prices consistent with quality, and as give best service. All job purchase orders must be numbered consecutively, from No. 1 up, and each number accounted for to the home office, even though canceled, in which latter case, the reason for cancelation should be given. Wherever possible, purchase prices should be given on orders.

In all purchasing, note particularly that needs should be studied and lists made of all required materials which can be obtained from a single vendor, and competitive prices secured where possible; then the list should be ordered all at once,—enough, but not too much.

Single rush orders of small items mean added costs, additional bookkeeping and possible delays.

Telephone orders should be used only for emergency, and should be followed at once by job purchase orders confirming.

Cash should never be paid for any item to a vendor with whom there exists a charge account.

No general foreman or other employe should open a charge account away from home. They shall pay cash and their credit will not be recommended.

10. *Construction Forces.* One of the first duties of a general foreman upon arriving at a job will be to examine the local labor situation and report upon it in detail to the home office, advising what can be counted upon, what preferences are expressed by the owner, and any other suggestions of value. He will confer with the construction manager on the subject from time to time and will follow his instructions, employing always the best men available, at rates determined, getting best values at all times. In general, skilled labor should never be employed for work that can be done more economically by common labor. Workmen will be paid only for time actually employed, unless other special provision is approved by the home office. Over-time is only to be used when expressly pre-arranged for or in actual emergency. Foremen are to be employed only when the number of men in any trade warrants. The work done by themselves, as well as by the men under them, should be kept at maximum, just the same as if directly overseen by the general foreman. A week's work will consist of 44 to 60 hours' regular time, depending upon the season and the project's requirements, of which all employes are to be kept informed. Holidays will be observed, except in emergencies (approved by home office), and no pay allowed for them, unless pre-arranged. Pay for transportation or other unusual expenses must also be pre-arranged.

11. *Subcontracts.* When expedient, subcontracts will be let for specific work. The general foreman will be provided with copies of all such contracts and specifications governing them and will act as inspector of all work included therein; he will see that ample notice is given each subcontractor ahead of time such work is needed (particularly for members to be built into walls and concrete), that all provisions of such contracts are properly fulfilled, that the work is properly correlated with that of others,

This Report must give a complete accounting of *all* material on hand and received; its use, etc. Record must be carefully kept from day to day; balanced weekly and made out in triplicate each Tuesday. One copy each to Owner, Home Office and Job.

THE W. W. BEACH COMPANY
ARCHITECTS ENGINEERS BUILDERS
SIOUX CITY, IOWA

WEEKLY MATERIAL REPORT

FROM _____ TO _____

OWNER: _____
LOCATION: _____
JOB NO.: _____
DATE: _____

DATE	MATERIAL	QUANTITY REC'D	COST				PREVIOUSLY ON HAND	QUANTITY USED	HOW USED	BALANCE ON HAND
			RATE	AMOUNT	FREIGHT	HAULING				

SIGNED _____ SUPERINTENDENT

Weekly Material Report (Size 8½ by 11 inches)

DAILY CONSTRUCTION REPORT

A report must be fully made out in duplicate, one kept on job and one mailed promptly to Home Office, six days a week and also on Sunday, if work is done that day. Each report must be an accurate record of conditions existing, job requirements, causes of delay etc.

THE ABCDEFG COMPANY
ENGINEERS ARCHITECTS BUILDERS
CHICAGO. ILLINOIS

OWNER
LOCATION
JOB NO.
DATE

WORK DAY NO. FORCE WORKED HOURS WEATHER CONDITIONS A.M. P.M. TEMP. To

NUMBER AND KIND OF WORKMEN EMPLOYED

ABCDEFG Co'S. PAYROLL

TRADES	FOREMEN	MEN	TOTAL
OVERHEAD AND OFFICE MEN			
GRAND TOTAL			

OTHER PAYROLLS

TRADES	FOREMEN	MEN	TOTAL
GRAND TOTAL			

Work to-day Consisted of

Cause of Delays, if any

Material Needed *Ordered (When)*
Expedited (How) *Expected (When)*
Drawings or Imformation Needed

First Requested
Daily Letter

(Use Other Side if Necessary) (SIGNED) GENERAL FOREMAN

Daily Construction Report Blank (Size 8½ by 11 inches)

and that amounts of partial payments demanded are proper and duly proportionate. Prior to the letting of such contracts, either by the home office direct or by the general foreman under order from the home office, it is essential to know (1) the general reputation of the party whose bid it is proposed to accept; (2) his equipment and other fitness for the work; (3) the attitude of his employes toward the architect's organization and its probable effect; and (4) the name of his liability insurance company and number of his policy, if the contract is to include labor at the job.

12. *Permits and Ordinances.* Before beginning a given project, the general foreman must familiarize himself with local and state ordinances and laws relating to the work and shall take out and pay for such permits as may be required, notifying the home office if any bonds are necessary. In general, subcontractors for plumbing, wiring and the like will secure their own permits, but the general foreman must see that those who do such work are properly licensed. Great care must be taken as to street and alley obstructions and occupancy of adjoining property.

13. *Insurance, Accidents, Etc.* The owner will carry fire insurance on work and equipment, and the company will maintain workmen's compensation insurance, but the general foreman will be expected to do all in his power to prevent fire and accidents, maintaining temporary fences and barricades, danger signs, "No Smoking" notices, red lights and other means of warning employes and the public. He must personally inspect all equipment, hoists, ladders, scaffolding, shoring and other possible sources of danger, known capacities, and see to and

make everything safe. He will be supplied with a "first aid kit" and must make himself and at least one other man familiar with its use, as well as seeing that it is kept properly filled. Telephone numbers of doctor, hospital, ambulance service, police and fire department must be prominently displayed in the office. All accidents must be reported promptly to the proper authorities and in detail to the home office, giving cause, result, treatment, present status, attending physician and means adopted to prevent the recurrence of accidents. Try to prevent the first accident as well as the next. Do not permit men to ride on material hoists.

14. *Temporary Buildings.* Such temporary structures as are directed by the construction manager, built as he instructs, are to be located to the best advantage and constructed as soon as possible after the arrival of the general foremen, who shall bear in mind their possible use in cold weather and also their value and disposition at completion of the work.

15. *Daily Construction Reports.* Daily construction reports are to be made out in duplicate, the original sent to the home office (mailed on day it records), and duplicates kept in proper sequence in job file. When so directed, a third carbon copy must be provided for the owner. Each detail of required information must be clearly given, and the progress of work from day to day given in percentages on in manner directed by the construction manager. No letter, other than that on the daily report, to the home office is necessary.

16. *Job Correspondence.* In general, all correspondence relating to a job will be handled by the home office, with copies to the general foreman of such letters as are needed in job file. The general foreman will hold to a minimum all correspondence with outsiders, thus avoiding duplicating the work of others. Emergency matters having to do with expediting, corrections, etc., should be handled promptly by mail, telephone or telegraph, with copy to the home office in each case. All correspondence regarding shop drawings, also their checking, will be handled by the home office, but copies will be sent the general foreman for approval or record. These and all other correspondence records shall be carefully filed. All mail for the work will be directed to the company, for which purpose the general foreman shall promptly provide a street address or will rent a post office box, if preferable.

17. *Telephone and Telegraph Service.* On day of arrival at a job, the general foreman will call at the local telegraph and telephone offices and make arrangements for prompt service, both day and night. If a job phone is to be installed, the contract should be made at once in the name of the company, so that it can be put in as soon as the office is ready. Unless confirmation is made by job purchase order, all telephone calls of importance must be recorded in duplicate on "Telephone Record" blanks, one copy to home office and one to job file. A third copy must be made of messages of sufficient importance and sent to other party to the conversation for confirmation. Such confirmation may be a deciding factor in some important matter.

18. *Changes* from the work as laid out by drawings and specifications are always a fruitful source of error and expense and are to be avoided as much as possible. The general foreman must never suggest a change to the owner nor allow another employe to do so. Advice and constructive criticism are always welcomed, but the home office will take care of all business dealings with the owner. The general foreman is sent out to construct the building in accordance with drawings and specifica-

WEEKLY PAYROLL REPORT

THIS PAYROLL MUST BE MADE OUT IN TRIPLICATE EACH WEEK AND DUPLICATES SENT TO HOME OFFICE NOT LATTER THAN THE FOLLOWING TUESDAY	THE ABCDEFG COMPANY ENGINEERS ARCHITECTS BUILDERS CHICAGO, ILLINOIS	OWNER LOCATION JOB NO.
	FROM TO	DATE

NO.	NAME AND TRADE	WORKED AT	DATE / DATE	S	S	M	T	W	T	F	HOURS	TOTAL HOURS	RATE	AMOUNT
	TOTAL													
	(SIGNED)										GENERAL FOREMAN			

Weekly Payroll Report Blank (Size 8½ by 11 inches)

tions and has no authority to make any change whatever without first consulting the construction manager or home office. The home office must receive immediate notification in event of any dispute with or expression of dissatisfaction on the part of the owner, and that portion of the work affected shall not proceed until a decision (permanent or temporary) has been made.

In the same way these important subjects are taken up in order and specific instructions given:

19. Extra Work Orders
20. Payrolls
21. Funds for Payrolls and Incidentals
22. Hauling
23. Returnable Items
24. Transferred Items
25. Weekly Cash Reports
26. Tool Reports
27. Equipment Reports
28. Weekly Material Reports
29. Cost Accounting
30. Cost Schedule.

In General. The loyalty of the home office to the interests of the owner is its first consideration, but the success of its building methods depends largely upon the loyalty of employes to the home office. The first sign of dissatisfaction on the part of the owner is generally found to be due to gossip of disappointed local competitors or of their employes or some one who has been discharged. This should be watched and defeated if possible, the home office being always kept informed. The owner must be shown a whole-hearted attention to his interests that is thoroughly convincing. The general foreman should also keep the home office fully informed as to all other matters relating to the work in hand and regarding any other items of building activity or prospects in the vicinity in which the home office might be interested. While the particular work in hand is supposed to demand all of the general foreman's time (including overtime when necessary) regardless of regular hours, it is assumed also that he will be alive to what is going on around him,—that he possesses something better than a "one-track mind." He will be expected to so conduct himself and his affairs as to obtain these results when the work is completed: A. A first quality structure, as set forth in drawings and specifications. B. Completion according to time schedule or better. C. Closure or complete adjustment of all unsettled matters and accounts preparatory to the final billing. D. A written acceptance by the owner, to be obtained by the construction manager, indicating entire satisfaction.

The foregoing instructions, although apparently somewhat lengthy, will by no means be found adequate for all work. Much still devolves upon the construction manager in the way of advice, and still more upon the experience and initiative of the general foreman himself. In this article, we are dealing only with the duties of purchasing and supervising. Auditing and accounting require the services of an expert bookkeeper. Hence, with proper care in building up his field organization, it should be apparent that the high class architect is at least as well qualified to engage in actual building as is the general contractor to undertake to do his client's planning.

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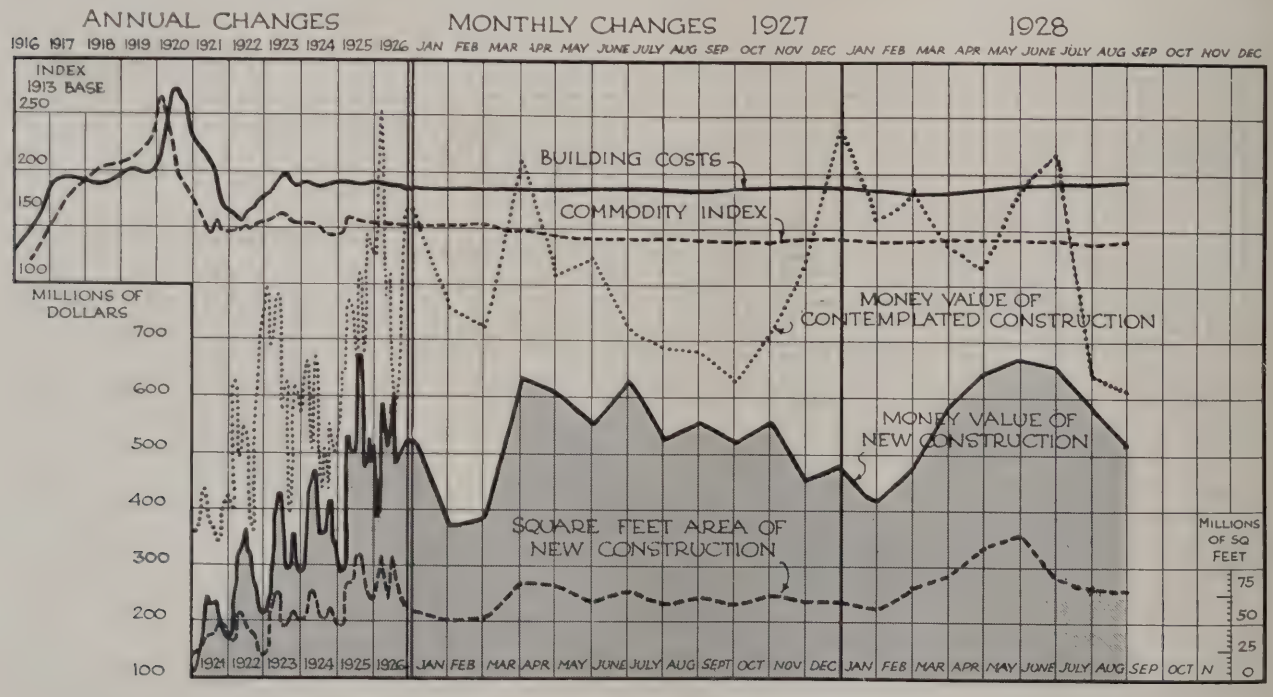
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE usual summer slump in both the volume of new construction and the amount of contemplated work took place during July and August, although not in sufficient measure to prevent the first seven months of the year from establishing a new record for the total amount of construction. According to the figures of the F. W. Dodge Corporation, the building and engineering contracts awarded during July in the 37 states east of the Rockies amounted to $583,432,400. This represents about 91 per cent of the entire country, and the figure was the highest July contract total on record. It was 9 per cent ahead of the July, 1927 total, but was a drop of 10 per cent from the total for June of this year. Two districts made new high totals for the month of July, —the Middle Atlantic States and the Central Western States (which enjoyed the highest monthly totals ever made in these territories, while the New England and the Southeastern States exceeded the volume of construction over July, 1927. In New York state and northern New Jersey, in the Pittsburgh district, the Northwest, and in Texas there was a decline as compared with July, 1927 figures; and only in the Central Western, the Northwestern and in the Southeastern States, did July totals exceed the figures recorded for the preceding month of this year.

The distribution of building construction by types showed $228,734,800 or 39 per cent of the total for residential construction; $137,074,700 or 23 per cent for public works and utilities; $95,696,800 or 16 per cent for commercial buildings; $36,926,400 or 6 per cent for educational projects; and $31,399,800 or 5 per cent for industrial projects. A decided drop in new work contemplated took place during July, the total for the month being $647,682,700, which is a loss of 37 per cent from the amount reported in June, 1928, and a drop of 7 per cent below the amount reported for July of last year. In August construction contracts to the amount of $516,970,200 were awarded in the Eastern States, which is about 11 per cent below the July figure and 6 per cent below the figure for August, 1927. The New England States and the Northwest were the only two districts showing increases over their July, 1928 records, and the Central West, Northwest, and Southeastern States were the districts which showed increases over their records for August of last year. The total amount of new building and engineering work started since the first of the year amounts to $4,545,270,100, an increase of 6 per cent over that of 1927.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

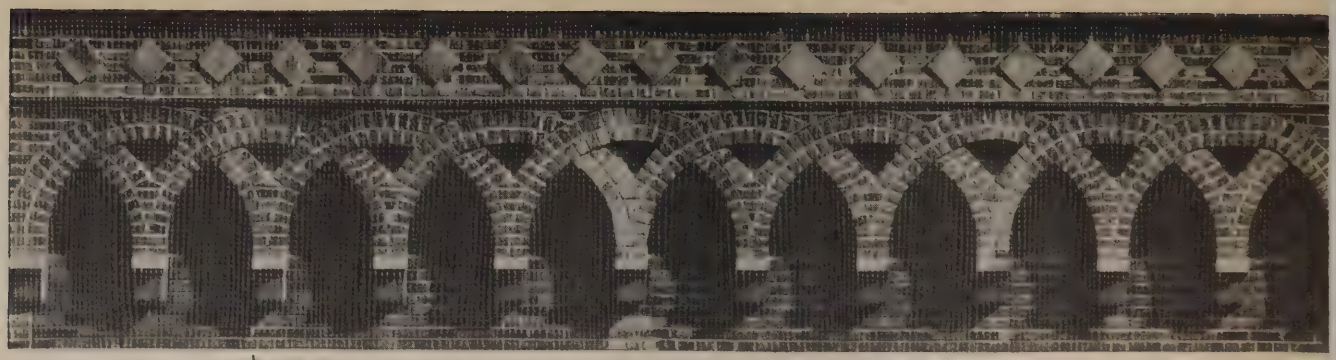
THE ARCHITECTURAL FORUM

IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

NOVEMBER

1928



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BOOK DEPARTMENT

THE FLORIDA ARCHITECTURE OF ADDISON MIZNER

A Review by LEIGH FRENCH, JR.

THE description of an architect's training for his profession, as found in Miss Tarbell's introduction to "The Florida Architecture of Addison Mizner," carries with it that breezy spirit of energy and vitality which characterized the great adventurers of the sixteenth century, whose accomplishments are still sung. This introduction is of a sort rarely found in books about architecture, and it is more revealing in its commentary on the work illustrated in the succeeding pages than any amount of architectural discussion would probably be.

A Terrace at Lake Worth, Fla.
Addison Mizner, Architect

The amount of work accomplished by Mr. Mizner in the comparatively short time of ten years is in itself amazing. Added to this, the enormous variety of treatments, all generally within one type, is bewildering. The great difficulty of the beginning of this work, where every form of labor and artisanship was conspicuous by its absence from Florida, marks its achievement as a *tour de force* of the first order. All of these attributes of the building of Mr. Mizner in Florida are rendered explainable and understandable through a knowledge of his pioneer background, his adventurous youth, and his period of studying abroad the handiwork of the great architects and builders of the past. When opportunity came to him he was found superlatively equipped to put into three dimensions the dreams which he had for beautifying and developing a part of America which offered many natural advantages suited to his needs. The type of architecture which he visualized in this setting of sub-tropical vegetation is a modified Spanish, whose original forms show many traces of electicism. His planning is free of the binding pressure of precedent, his houses being built to live in with modern ideas of comfort. His fenestration is arranged to take advantage of the light and air, so great an asset to the Florida coast. The vivid hues of the sea and sky encouraged the use of colorful materials for building and decoration. The brilliant sunlight brought about a skillful studying of the projections of those elements of his buildings which cast the telling shadows.

A comparison of the exterior view of the present Everglades Club with the houses later built, shows the progression from a somewhat complicated to a simplified massing and a greater breadth of design. The invitation to sun and air is seen, as the plans are adapted to the conditions of the locality, in central masses with extended wings or with towers which gain the maximum exposure on at least three sides. Very charming is the street architecture which gives its especial air to localities where the great houses of the ocean front are built. Here there are conscious picturesqueness and variety, fascinating vistas and tiny piazzas. The shops behind these walls no doubt should smell of garlic and fresher vegetables, but no doubt they exhibit to the visitor the richest wares of Fifth Avenue, Bond Street and the Rue de la Paix. The "Villa Mizner," opening from the street of the same name, acquires thereby an especial personality and appropriateness which it would lack as a separate great house on the ocean front. It gains the dramatic quality possessed by many ancient houses abroad, which, opening from unpretentious or even grimy streets, give glimpses of patios massed with flowers or gardens leading from one patio or courtyard to another.

It is very difficult to judge of a great deal of architecture solely from photographs; sometimes they show up defects which are scarcely noticeable in the originals; sometimes they gloss over or soften points which would strike one in seeing a building in three dimensions. This is particularly so in the case of the illustrations in this book. With very few exceptions, the photographs are extremely well composed, the suggestions of light and shade, of vistas and of contrasting textures are well rendered. There seems to be a very human scale in most of the detail photographs. The only question which arises is how genuine this extensive and picturesque architecture really appears. It is one thing for a house to express its growth over a period of centuries, with its changes of style or its reflection of the fat and lean years of its owners. It is another, and a psychologically erroneous thing, for a building to express all of these qualities when it has all been built within a period of a year or two, and obviously when the ears of wheat were full. To be sure, the whole climatic condition and geographical setting are keyed up to so different a pitch from that of the northern, more temperate climate, that in such an environment the gorgeousness and wealth of this architecture may take its proper place and clothe itself with complete reality.

Of the interiors of these Florida buildings, much should be said. Perhaps nowhere in America,—certainly nowhere along the Atlantic seaboard,—is this consistent

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English Church Woodwork

By

F. E. Howard and F. H. Crossley

A BRILLIANTLY written study of the marvelous woodwork with which many old English churches are still filled, —carved altars, rood screens and rood lofts, choir stalls, canopies, testers, pulpits, lecterns, benches, and all the accessories upon which English wealth and piety lavished care during centuries. The designer as well as the wood carver or practical wood worker would find its 480 illustrations of incalculable value.

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utilization of Spanish and Italian forms of decoration and furnishing so appropriately made. The palatial scale of many of the houses gives opportunity for interiors really grand. High ceilings and huge expanses of wall and floor provide for the furniture a setting so airy and spacious that its essentially architectural character is given its rightful authority. High beamed ceilings, sumptuous in themselves, are fitting crowns to walls frescoed or hung with tapestries. Plastered or stone walls are pierced effectively with doorways surrounded with carved stone, set with gay tiles or surmounted with lunettes filled with sculpture. The more successful interiors would seem to be those in which the architecture has been kept to its simplest, the detail spotted for its effect of light and color. Less effective are the vaulted interiors, reminiscent of ecclesiastical usage, which, even in modern domestic architecture, have the wan expression of strange guests. Supplying the missing color, of which there is undoubtedly a blaze to these interiors, gives them a reality greater than their especial stylistic quality has achieved in this country before. Certainly in the north the taste for the "Mediterranean" styles has long past. Here it finds itself in a fitting environment. With free imagination are combined tiles in plain colors for floors, with painted patterns for walls; old woodwork and stone, plain and sculptured; stucco ornament and delicate wrought iron. Everywhere the suggestion of the luxurious vegetation of the country is brought into the buildings in the massing of potted trees and flowers in entrances, on stairways and in rooms great or small. In this detail, no doubt quite as important to Mr. Mizner as some of the more purely architectural, we see a characteristic of his work, the consistency between the exteriors and the interiors, which is one of its greatest distinctions and chief charms.

There is little good in describing a book of illustrations. One must see to believe,—even to understand. In this group of plates showing the work of one man there is much to ponder over. But one should first read the introduction. This large volume is one of the most handsomely designed and printed contributions to the architect's library to appear in many a day. The paper is fine, and the page design and typing of a quality seldom met with in the field of architectural publication. Aside from what benefit an architect derives from looking at views of another man's work, this volume holds a great deal of pleasure for professional and layman alike.

THE FLORIDA ARCHITECTURE OF ADDISON MIZNER. With an introduction by Ida M. Tarbell. Illustrated. 184 pp., 12 x 16 inches. Price $20. William Helburn, Inc., New York.

AMERICAN FURNITURE AND DECORATION, COLONIAL AND FEDERAL. By Edward Stratton Holloway. 191 pp., 6 x 8½ ins. Price $5. J. B. Lippincott Company, Philadelphia.

THE interest which architects and interior decorators find in furniture is both logical and practical, since use of correct or incorrect furniture may enhance the importance of an interior or may contribute to the marring if not to the ruin of the aims of the architect who designed the building and its interior architecture. The importance of the subject might perhaps be gauged or measured by the number of volumes on furniture which have appeared during the last few years,—popular manuals, in many instances, intended for the laity and so

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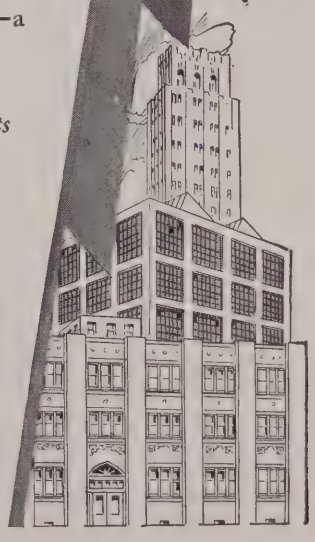

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THE 1928 year book of the Boston Architectural Club constitutes a rich mine for the architect concerned with Gothic detail. Here are given plans and measured drawings of old English domestic structures and their exterior and interior details, while of churches, chapels, chantries and similar buildings there is given a surpassingly rich collection of drawings of structural details as well as of accessories. The volume is particularly valuable because of its drawings of comparatively simple work in wood and metal, all of which are directly adaptable to present-day conditions. The plates are selected from the Sketch Books of the Architectural Association, of England.

63 pp., 10½ x 13½ ins. Price $7

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SHOP FRONTS
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Edited by
FREDERICK CHATTERTON

A study of the modern shop front, drawing for inspiration on the fine old fronts which still exist in England, France, and other countries of Europe. The volume includes in many instances plans and details. This is a work of practical value to architects called upon to plan and design the facades to small buildings, making them practical as well as architecturally attractive.

104 pp., 9¾x12 ins. Price $7.50

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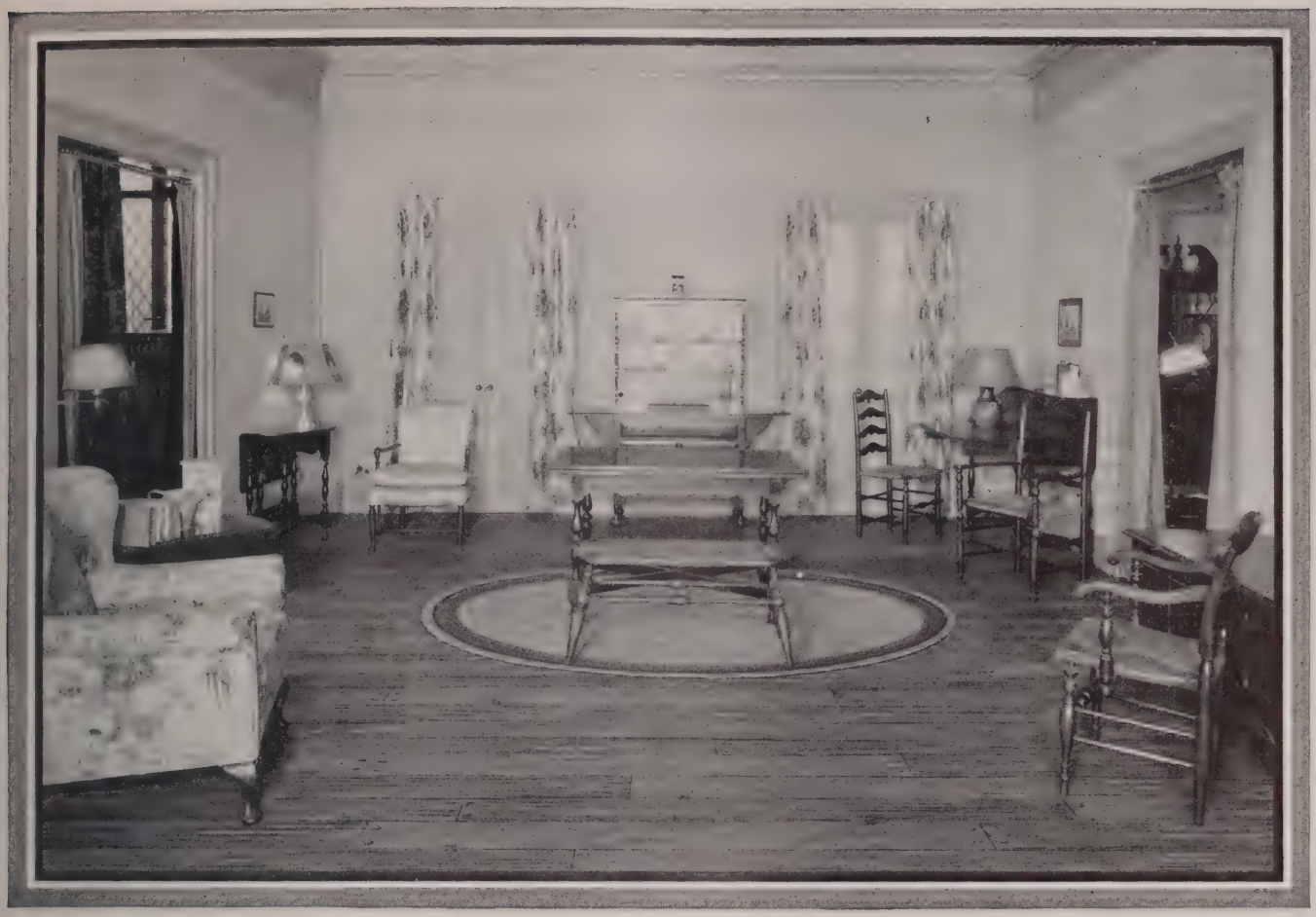
written that they lay no unduly heavy tax on either the time or the attention of those who presumably desire merely an outline of a subject with which any reasonably intelligent person wishes to be informed, while in other instances the treatment has been careful to the point of erudition, some of these works in fact having been written wholly or in part by architects and naturally prepared from their point of view.

This particular volume is a recent addition to the number of excellent works dealing with subjects more or less related to architecture which the Lippincott firm has been publishing for several years. The author is a well known writer on the subject which he discusses, and "this volume treats and illustrates the furniture and decoration of each style by itself and in proper chronological order. It shows the features and characteristics of each style so that they are quickly learned. It tells in what respects these styles differ from each other, where they came from and why they came,—in short, how the furniture 'got that way.' It shows wherein American furniture and decoration differ from their sources because of American conditions and the innovations made by American craftsmen. It also traces back to those sources and shows how closely in many other cases we were working to the English and French modes. Much research in this direction has been added to the author's wide knowledge of English and Continental furniture. Special help is given the reader on such points as differentiating between the styles of Hepplewhite and Sheraton, which are so nearly similar as often to be exceedingly puzzling. An entirely new feature is the including in this book of chapters on the interior architecture of the best American houses during the various periods, and the floor coverings, decorative fabrics, mirrors, etc., that properly accompany the furniture. The volume includes the latest discoveries of previously unknown cabinet makers. It is therefore authoritative, easy to use, and completely up-to-date. The delightful style makes the text interesting to read."

OLD SILVER OF EUROPE AND AMERICA. By E. Alfred Jones. 376 pp., 7½ x 10 ins. Price $8.50. J. B. Lippincott Company, Philadelphia.

ARCHITECTURE, along with its complement of decoration, takes note of everything which is included in the designing of a structure and its contents. The intrinsic preciousness of silver undoubtedly accounts for much of the care and skill which have always been lavished upon silver's designing and fabrication, and the various periods of architecture and design which during centuries have been following one another across the stage of western Europe and America have left their indelible impress upon the silver made for use ecclesiastical or for use domestic.

Mr. Jones is the author of quite a number of works on silver. He has long studied the silver of England and its simplified counterpart which was produced in America chiefly during the eighteenth century,—silver which was characterized by all the slender and attenuated elegance of the age. But in this massive volume he fares much farther afield and includes in his study the silver of almost all of Europe. For the American, however, the volume's chief interest lies in Mr. Jones' excellent treatment of the work of American silversmiths who flourished not only in New York, Boston and other cen-



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ters of population but also in Newport and other smaller towns. Then too, much silver was imported from England by wealthy colonists, and various sovereigns,—notably Queen Anne,—were pleased to encourage increase of piety in the colonies by presenting to certain parishes silver for altar use, sets consisting usually of chalices, patens and flagons. The work gives every evidence of careful scholarship, and its illustrations abound in interest and value to students no less than to collectors.

THE OLD COTTAGES AND FARM HOUSES OF NORFOLK, By J. W. Messent. 248 pp., 7½ x 9¾ ins. Price $5. H. W. Hunt, 14 Orford Hill, Norwich, England.

TRAVELERS in various European countries bring back discouraging reports of the decay which is going on in old buildings in the rural districts,—structures which American architects are willing to cross the Atlantic to see,—and the actual destruction by tearing down of buildings in cities which are often of high historical value as well as of architectural interest. Perhaps this destruction is but one manifestation of a restless and impatient age, for indifference to old buildings and ancient landmarks can scarcely be said to be confined to European countries; it has caused the almost complete obliteration of what was once of value in New York and Boston, and has left but little in such more conservative cities as Philadelphia and New Orleans.

"The object of this book is to describe and illustrate the many fine old cottages and farmhouses of Norfolk, some of which are fast falling into decay, and are being replaced by modern and often less picturesque buildings. Some of the cottages are being carefully restored, but others (alas!) are heart-breaking sights to those who remember them in their former glory. Thatched roofs have been stripped and corrugated iron put on, the latter often painted a hideous red in an effort to imitate tiles. Carstone cottages in West Norfolk have sometimes been restored with ugly pink bricks, and many a fine old brick Tudor chimney-stack has been deprived of its caps and shafts, the latter being replaced by ugly square stacks, or else 'tall boy' pots have been placed upon the old moulded bases of the stacks. This dreadful mutilation of old work is by no means confined to Norfolk, as the author, during the last two years, has visited over 30 counties in England and Wales and has seen the same thing going on practically everywhere. It is in the hope that the public may be led more fully to realize what a splendid heritage it has in these fine old cottages and farmhouses that the author has written and illustrated this book. Many of these rural dwellings stand in rather remote and inaccessible parts of the country; some are only reached by traversing a grass track for over a mile. The author has carefully avoided well known examples in choosing subjects for illustration which have often appeared in guide books and histories of the country. This book, besides giving an architectural, historical and individual description of the cottages and farmhouses of Norfolk, has a chapter allotted to a description of farm buildings and the fine old dovecotes or pigeon houses that are to be found mostly in private parks on estates."

"CHURCH BUILDING"—*By Ralph Adams Cram*

(A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of churches and of their worship.

345 pages, 6 x 9 inches, Price $7.50

ROGERS & MANSON COMPANY, 383 Madison Avenue, New York

THE EDITOR'S FORUM

JOSEF HOFFMANN, ARCHITECT AND CRAFTSMAN

By PARKER MORSE HOOPER

IN this issue of THE ARCHITECTURAL FORUM it is our pleasant privilege to present a brief review of some of the recent architecture designed by Josef Hoffmann of Vienna. As one of the outstanding figures in the expression of fresh thought, inspiration and originality in architectural design today, it would seem not unfitting or untimely to acquaint ourselves more fully with his life and work. We therefore quote from an appreciation by Peter Behrens.

"Whenever in Germany or any foreign country the conversation is directed to Austrian art, one's thoughts turn at once to Josef Hoffmann. Now that Otto Wagner, who in the nineties was the inspired leading spirit in Vienna's artistic life, has passed away, it is Josef Hoffmann who inspires and stimulates. In the same way as Wagner in his time was the genius of city building, Josef Hoffmann's true profession is that of architecture. But in spite of this, and perhaps exactly for this reason, he, like Wagner, influences the whole artistic product of his country. Although Josef Hoffmann was a pupil of Otto Wagner, it is not because of this or through this that their encompassing interests are related, but rather because great and true art is only possible by a unity of all the arts. Hoffmann early went other ways. In his early twenties he left the Academy and formed a group of young artists consisting of Josef Olbrich, Koloman Moser, Gustav Klimt, Andri and others, who a little later founded the Vienna 'Secession.' It was a period full of storm and stress, a period of seeking rather than of finding. It was soon over, and everywhere, as with like movements in other countries, one remembers it only with a smile, because today's aims are more serious and of greater importance, due to the fact that everything creative is closely connected with everyday life. But without the 'Secession' it would not have been possible to found the 'Wiener Werkstatte' whose creator was Josef Hoffmann. In the same manner that Austrian taste today is irrevocably bound up with the name of Josef Hoffmann, it is closely allied with the Wiener Werkstatte. The objects made in the Wiener Werkstatte are known, appreciated and valued far beyond the frontiers of Austria. The individuality of their art is unmistakable. Apart from their high qualities, they possess a distinct, determinate character. In foreign countries it is something 'specific Viennese,' in the highest meaning of this term, which unconsciously attracts attention.

"Josef Hoffmann is a native of Moravia. In his childhood he came to Vienna, where from his earliest youth he imbibed the Austrian spirit and culture. It was, therefore, inevitable that his sensitive, artistic nature should understand and love the essentially Austrian character, and should absorb fully Vienna traditions; traditions not in the old sense, but of the 'Wienerisch' as it lives in our day, in the city of Gluck, Haydn, Mozart, Beethoven, Schubert, Brahms and Mahler. The musical spirit of this city pulsates in all Hoffmann's work,—the musical and the poetic. The first thing that strikes one on entering a Hoffmann house is not its forcibleness but its perfect harmony between form and space, its simplicity and air of comfort which invite one to stay, promising quietude and well-being. These qualities are expressed in all the houses he has built.

"Josef Hoffmann stands in the front line of this generation of architects in Austria. This fame none will venture to contest. The remarkable truth that his talents as an original artist, as a teacher in the Vienna Arts and Crafts School, and as artistic director of the Wiener Werkstatte have resulted in the creation of so many objects of harmonious and artistic charm for domestic use, may be explained by the fact that all his conceptions are based on architectural proportions. Each of his designs, even those for the most simple objects of everyday life, has been conceived as a part of an architectural whole, and in this lies the secret of their lasting value. It is today quite impossible to conceive the applied arts as independent. All objects not trivial and superfluous are connected, dependent and bound up irretrievably with a higher totality. And what we in our time have to thank Josef Hoffmann for is the universality of his artistic output and his teachings. Withal he is the most unassuming of men."

1928 AMERICAN RED CROSS ROLL CALL.

THE architectural profession in New York again this year is coöperating actively with the American Red Cross in its Roll Call membership appeal, which opens annually on Armistice Day for the support of its extensive welfare and relief and public health program. Aid for the ex-service man and his dependents still constitutes a large factor of the Red Cross program in New York. William Harmon Beers, of 333 Fourth Avenue, New York, again heads the activities as volunteer chairman of the special architects' group and will follow essentially the same plan of intensive effort which brought such generous response from the personnel of the field under his chairmanship in the 1927 Roll Call. A committee of prominent architects will coöperate with Mr. Beers to promote the success of the appeal.

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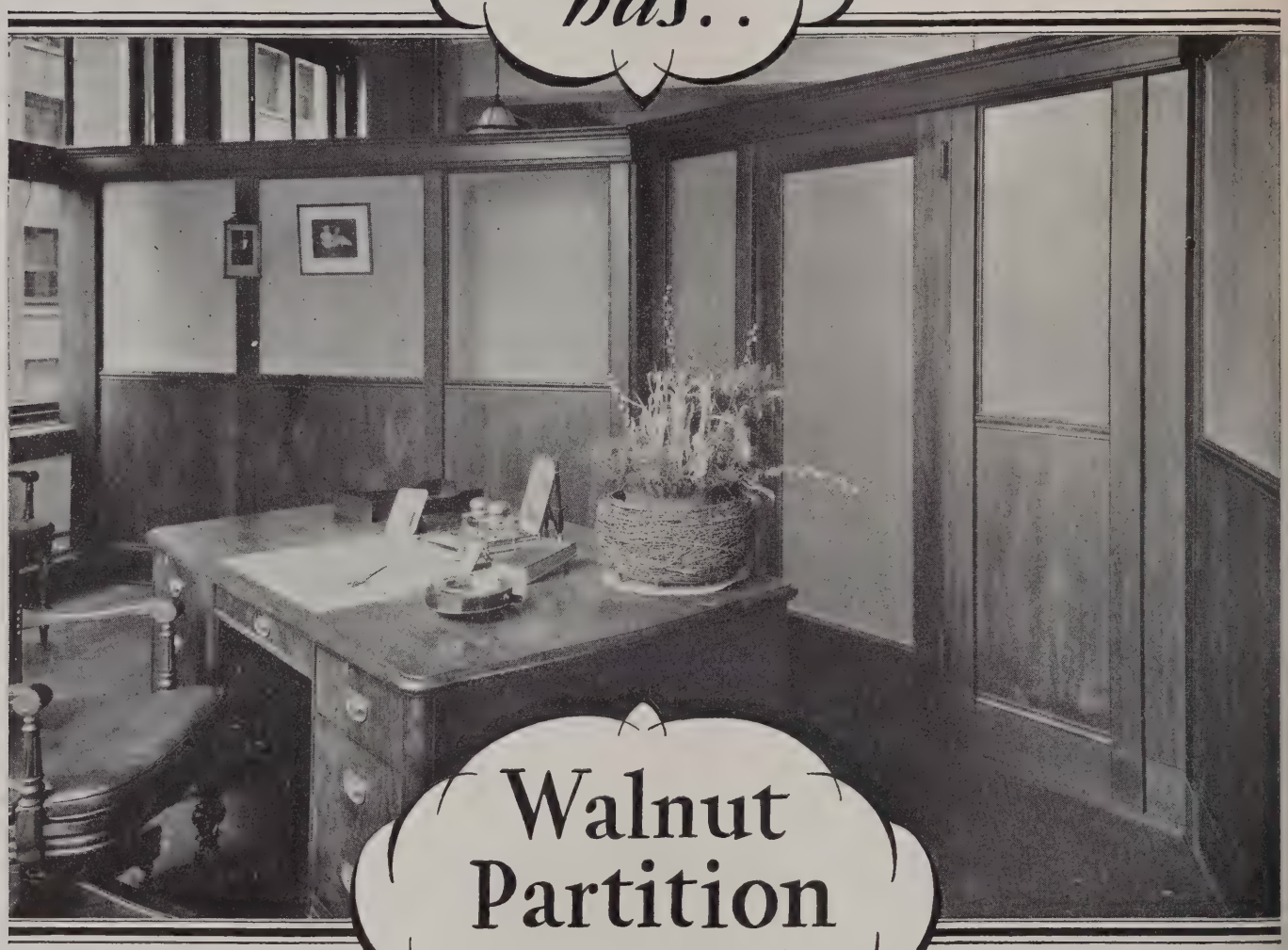

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CONSTANTINOPLE FROM THE BOSPHORUS

From a Water Color by Edward James Matthews

VOLUME XLIX

THE
ARCHITECTURAL
FORUM

NUMBER FIVE

NOVEMBER 1928

CONSTANTINOPLE

TEXT AND SKETCHES BY
EDWARD JAMES MATTHEWS

GEOFFREY of Villehardouin, one of the army of Crusaders who in 1204 captured the city of Constantinople, thus described the descent of the Frankish and Venetian vessels on the city: "Then might you have seen the straits of St. George as it were in flower with ships and galleys sailing upwards, and the beauty thereof was a great marvel to behold. . . . Now you must know that those who had never before seen Constantinople looked upon it very earnestly, for they never thought there could be in all the world so rich a city; and they marked the high walls about, and the rich palaces and mighty churches,—of which there were so many that no one would have believed it who had not seen it with his own eyes;—and the height and the length of that city, which above all others was sovereign."

More than seven hundred years later, in 1922, the crusading baron's description remained singularly applicable, and never, perhaps, even in the days of the later Empire, had Constantinople been filled with more widely divergent racial elements than on the brilliant August morning when we came down the Bosphorus from the Black Sea. In place of the Venetian and Genoese trading vessels that would have lain in the same roadstead in the middle ages, of the Frankish and Italian galleys, and the long ships that brought the members of the imperial bodyguard from their native Scandinavia, there were liners, rusty tramps, Greek barquentines, and the battleships of four nations. Huge British men of war lay like thunderclouds under the domed skyline. French and Italian cruisers swung anchored in columns along the Bosphorus, while American destroyers clustered against the shore, black ribbons of smoke rising vertically from their funnels. The inter-allied occupation of the straits was well established, and brisk trade was already under way.

In the city's streets the descendants of Venetian and Genoese traders, Frankish crusaders and English mercenaries were supplemented by Australians, black troops of both France and England, Arabs, Highlanders, little yellow Annamites, American "gobs" and an endless procession of other nationalities. Besides these there was the mixed population of Turks, Levantines, Greeks, Jews, Armenians, Persians, and blacks, each with a distinguishing dress or uniform. But of all the peoples that thronged the streets, the Russians seemed most numerous. Cossack officers of Wrangel's forces and soldiers of Denikin's defeated army were everywhere, gleaning somehow a sustenance from the crowded city. Their varied uniforms lent further variety to the kaleidoscope of the Grande Rue de Pera. Beautiful Russian girls strolled down the boulevards on the arms of smart British, French or Italian officers, or acted as hostesses and entertainers in the cabarets. "Maxim's," the famous night club run by the colored ex-valet of an American ambassador to Russia, was just beginning its career, and its dusky proprietor was giving employment to his former patrons in the capacities of doormen, hat check girls and hostesses. The city was again the focal point of eastern Europe, after five centuries of Turkish domination. Life in Constantinople at that time was fascinating, and made the study of architecture difficult. . . .

On the farther shore of the harbor from Pera, the European colony, Stamboul, lies on seven hills, a jumble of massed houses and white domes, stretching indefinitely to the westward. The clouds that hurry down the Golden Horn cast thin veils of shadow along the hills. Mosques that are momentarily in silhouette, gleam white against the sky when the shadow passes, while the brilliant cadmium and black of the shipping make a foil for the soft colors of the town above. At sunrise a rose colored mist envelops the city, pierced by the gold of the highest minarets and domes, and the city seems to fulfill one's most sanguine expectations; but a sad disillusionment is in store for the traveler who looks more closely, seeking the color of an Oriental town, and a feeling of disappointment is the usual reaction of the architect in the streets of Stamboul. Coming, as most do, from the lovely irregularities of Italian hill towns or of Carcassonne, or from the more sophisticated architecture of Rome, Paris or Florence, there seems to be little at close sight to recommend this sprawling city of frame dwellings. The costumes are picturesque and colorful,—or were in pre-Kemal days,—and the rather saccharine charm of dome and minaret remains a testimony to the accuracy of our cigarette advertisements; but of architectural beauty, little is to be seen. The vision of a white Oriental

THE MOSQUE OF AHMED
From a Pencil Sketch by Edward James Matthews

COURTYARD OF A MOSQUE
From a Pencil Sketch by Edward James Matthews

THE TERRACE OF SULEIMAN
From a Pencil Sketch by Edward James Matthews

THE KAHRIE DJAMI
From a Pencil Sketch by Edward James Matthews

CONSTANTINOPLE FROM THE LAND WALLS
From a Pencil Sketch by Edward James Matthews

city, serene above a cobalt Golden Horn, is not realized, nor is any expectation of immediately visible Byzantine or classic survivals. Constantinople is neither Oriental nor Occidental, and it lacks the essential picturesqueness of the one without approaching the ordered reasonableness of the other. Its quality is unique and lies so much within the sphere of intellectual rather than that of purely æsthetic appreciation, that discussion of it has small place here. It lies in a kind of arid beauty,—in a sadness of decay, of which one is conscious only in the more remote quarters of the old town or in solitary walks outside the "Land Walls." Here, miles from the bustle of the Galata Bridge and the bazaars, it is especially to be sensed. The old Byzantine fortifications are nearly intact, their tops overgrown with weeds and showing occasional gaps where the stones forming the crenelations have fallen. To the westward from the battlements, the undulating plain, sere and yellow in the dry windless heat, stretches along the Golden Horn to Eyoub. Its mournful expanse is dotted to the horizon with irregularly spaced shafts marking Turkish graves. Dusty, ancient cypresses stand among the tombstones. On the east the roofs of the city start abruptly at the foot of the walls, and, diminishing in the distance, interspersed with the broken and roofless minarets of abandoned mosques, rise gradually to a culmination in the great mass of the Suleimanic mosque. A haze of heat usually subdues the piled dwellings to uniform grays and brown, broken by the harsh yellow of barren, stony ground. The predominating note is one of dilapidation and squalor, impressive only because of its magnitude. A sultry quiet invests the city; a cry from below or the distant clamor of the busy harbor only serves to emphasize the oppressive stillness. Nothing is wholly intact. Bits of wall, broken minarets, dilapidated lattices conspire in creating a sense of hopelessness. Nothing is uniform, nothing rectilinear; the irregularity is so universal as to create an effect of monotony. Yet this unredeemed drabness, having none of the conventional patina that sometimes lends beauty to decay, fails in being wholly hideous. It has a quality of impressiveness,—almost of beauty,—the perception of which is contingent upon a realization of the magnificence of the past, for the surviving monuments of Byzantium are submerged beneath constantly changing masses of frame and stucco buildings. These are pieced together from the remains of previous survivals of fire, siege and decay,—an accumulation that has continued from the early middle ages and has gradually eliminated most vestiges of the Roman city. Historically, Stamboul is filled with associations. The form of the ancient Hippodrome is still traced by streets.

The great cisterns built by Constantine and Justinian still exist, and the passage by boat through their echoing colonnades, with a lantern faintly illuminating the dripping shafts of the columns and the black water, is an extraordinary experience. The Serpent Column from Delphi, the obelisk erected by Theodosius, the *Colonne Brulee* and the Tower of Galata, built by the Genoese, are all survivals of a history filled with traces of widely differing nationalities and of the racial conflicts that were incessant for 14 centuries. One finds in the stony, winding streets occasional bits of wall that consist of single courses of dressed stone, separated by three or four courses of flat Roman bricks or tiles. These usually indicate the sites of ancient structures, but a building externally wholly Byzantine is rare, and the outline of a cupola, a moulded window reveal, or a fragment of vine pattern in a wall is usually the sole indication of the existence of a historic monument. A number of interiors, however, have been preserved. Those accessible are without exception churches, the Byzantine residences having been occupied and adapted by Turkish owners to their own mode of living. But, thanks to the fact that the Mohammedan ritual could be carried out in Christian edifices without radical changes to their plan and structure, a number of religious monuments dating from the sixth to the fifteenth century have been preserved almost unaltered as to their interiors. Had the Turks been nature worshipers or believers in some non-ritualistic faith, we should perhaps have had to depend on Venice and other western cities for our knowledge of Byzantine architecture. It is, then, to the churches that one must go to find the carvings, mosaics, and marbles that with certain structural principles comprise the contribution of Byzantium to architecture.

The most important of these are Sancta Sophia, built in the sixth century under Justinian, and its structural predecessor, Sts. Sergius and Bacchus, on the sea of Marmora. Both have been externally submerged by the efforts of the Turks to preserve them from destruction. The interior of Sancta Sophia is too well known to demand description. Sts. Sergius and Bacchus, however, aside from its mosaics and lovely capitals, is interesting as a structural experiment. It bears in some degree the same relationship to later Byzantine and Turkish buildings that the cathedral at Evreux bears to the full blown Gothic of Amiens and Beauvais. It shows a structural transition from the dome placed upon a circular drum, as in Roman precedent, to the dome brought by means of pendentives to the four corners of a square. In this instance the architect, groping for the principle later used in Sancta Sophia, employed columns placed at the angles of an octagon to support his cupola. The effect is unsatisfactory, necessitating as it does a "fudging" of the arch spandrels to effect the transition to the circular form. This dome is remarkable for its scalloped shape. It resembles a half-melon, the raised sections diminishing toward the apex.

St. Irene, near Sancta Sophia, is one of the few churches which has remained externally Byzantine. It is now a Turkish military museum and is filled with a fearful collection of lethal devices, its walls lined with colossal paintings of Turkish warriors pursuing neatly uniformed unbelievers. The dome of St. Irene is, to my mind, the finest in Stamboul.

A fourth church of interest was at one time the chapel of a Byzantine monastery, just inside the western walls of the city. It is, like the others, now a mosque, the *Kahrie Djami,* and it follows more nearly the conventional form of the Greek Orthodox churches as found in Athens, Saloniki, throughout the Aegean islands, Macedonia and in the Balkans. Its chief interest lies in the mosaics that cover the walls of the triple porch, and which vary in date from the dawn of the Eastern Empire almost up to the time of the Turkish conquest. The vigor and richness of these mosaics are extraordinary. Fortunately, an enlightened administration has rescued them from under layers of whitewash, and they glow with colors unimpaired in the soft reflected light that streams through the open door. I sat and sketched in the narthex of this church while good natured but unwashed Turkish soldiers watched, breathing heavily in my ear, as I attempted to draw.

Several smaller Byzantine churches are scattered about Stamboul. Each has some claim to the attention of students of architecture, but it cannot be denied that on the whole little remains that would indicate the greatness of Constantinople's past. Sancta Sophia, however, is an exception to this statement, and, epitomizing an epoch as truly as the Parthenon or Chartres, it is itself a sufficient reward for the long journey. Mohammed the Second, conqueror of the Eastern Empire in the fifteenth century, is said to have been responsible for the great buttresses that reinforce the dome. At the time of the Turkish conquest the edifice was much older, relatively, than is the Cathedral of Chartres today, and it is not surprising that the piers that had stood the strain of the two successive domes should have shown signs of weakness. St. Paul's in London has already demanded repairs upon several occasions, although built in comparatively recent times by one of the world's ablest engineers. How remarkable, then, is the achievement of Justinian's architects, Isidorus of Miletus and Anthemois of Tralles, who having evolved a structural form contrived in the first building constructed according to the new principle not only to span an enormous space but to build so well that when, 900 years later, the barbarians crushed the Eastern Empire, they found the great church intact!

The Turks brought little with them, but proceeded in their mosques to adopt the structural principle of the pendentive dome, building up to the present day according to the model left them by Isidorus, and there is little that could be characterized as purely Mohammedan architecture in Constantinople. Sancta Sophia's pendentive dome remained a model for all places of worship. The contemporary European styles influenced architecture in nearly all its phases. First Italy then France became dictator of Turkish taste. Painted ornament was introduced as an inadequate substitute for the mosaics of Byzantium. Tile was used largely for the same purpose and is perhaps the most interesting and beautiful factor of the Turkish style. But there is no evidence of any creative impulse. The Turks showed only the capacity to adapt existing forms and inventions to their own use, themselves changing not a little in the process. It was perhaps this latter quality of flexibility, this willingness to accept a useful innovation, that enabled them finally to capture the city. At the time of Mohammed the Second the Turks had already made themselves masters of the use of artillery for purposes of siege, an art that had then made little progress in Europe and of which the Byzantines were ignorant. It was the skilled gunners of the Turks and their ability to employ highly organized troops unencumbered by armor that routed the Byzantines. The great Empire that had withstood the batterings of Oriental hordes for centuries, succumbed on the night of May 29, 1453, when Constantine Palæologus, last of the emperors, rallied the remnants of his troops within the tottering walls of the great Hippodrome for a last hopeless stand. The Sultan Mohammed entered the city over the closely packed corpses of the Christian defenders, and according to legend rode his horse through the portal of Sancta Sophia. Thousands of Christians had taken refuge in the church and were crowded in terror under the great dome, beseeching God to preserve them from the barbarians. The story goes that the Sultan rode up to the high altar, and turning raised his hand as a signal that the massacre might begin. That moment marks the end of the Empire of the East. Sancta Sophia has become one of the greatest of Mohammedan places of pilgrimage. Constantinople, because of its situation, has been and must continue to be an important city. But with the Turkish conquest, the art of Greece that had beautified the Roman city came definitely to an end. Having conquered, the Turks settled down to the enjoyment of their prize, abandoned their nomad existence, and became an urban population that contented itself with gleanings of the artistic products of East and West. Sinan, the head architect or *Mi'mr Bashi,* of Suleiman II who lived in the sixteenth century, is celebrated as much for the versatility of the soldier-artist as for his creations. He is a great exception to the Turkish rule of artistic mediocrity.

One leaves Constantinople with an impression that both Byzantines and Turks, however inferior they may have been in some respects to the artists of Periclean Greece and of Rome, understood two things thoroughly,—the use of color in architecture and the use of small scale ornament for the enrichment of surfaces and architectural details. The oriental influence that appears throughout the city's history gave rise to a type or ornamentation that had far more of the abstract and purely decorative character of Asiatic work than even the European Romanesque, which of course derived from it to a great extent. Now that design is coming into its own again, and the day of "Expressionism" and Victorian symbolism seems to be finally drawing to a close, there is much to be learned in the field of decorative art from the lovely ornament of Byzantium.

Photos. Frances Benjamin Johnston *Details on Back*

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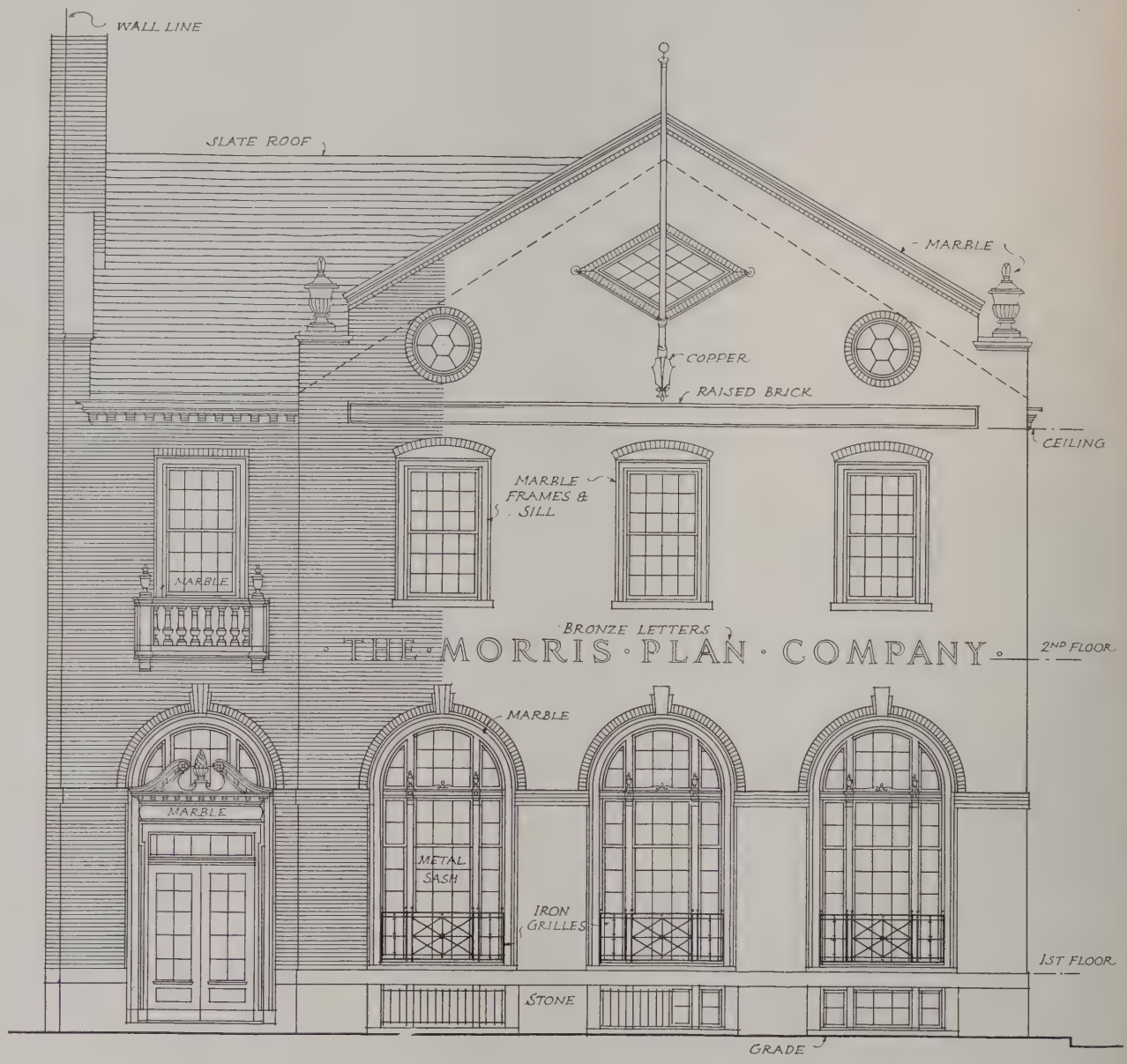

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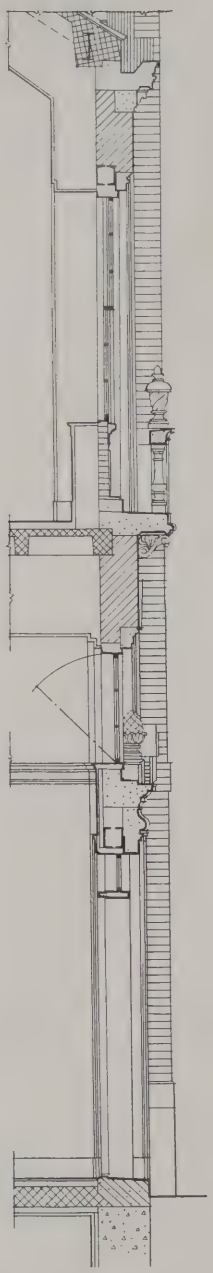

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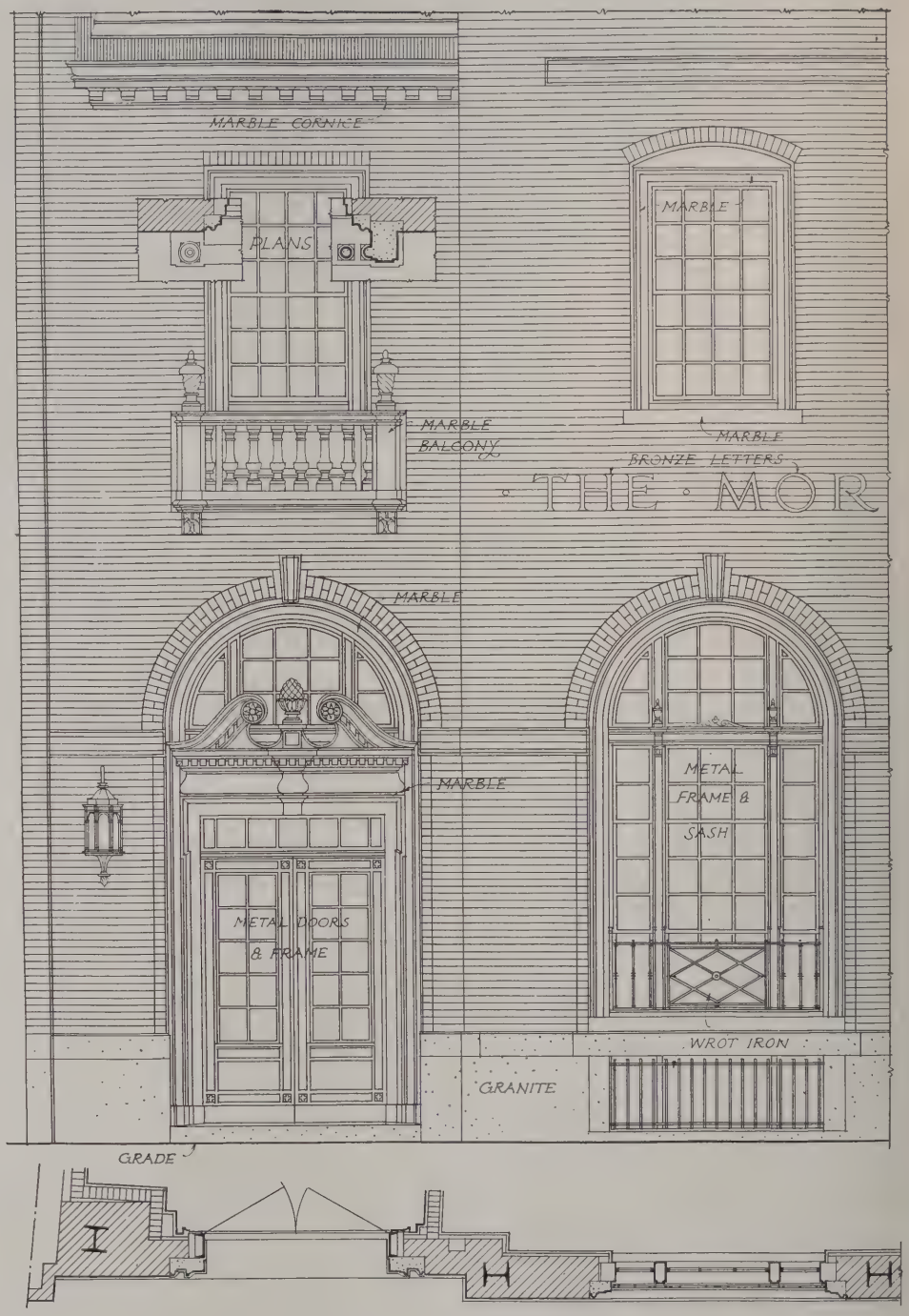

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The Architectural Forum Details

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MAIN BANKING ROOM
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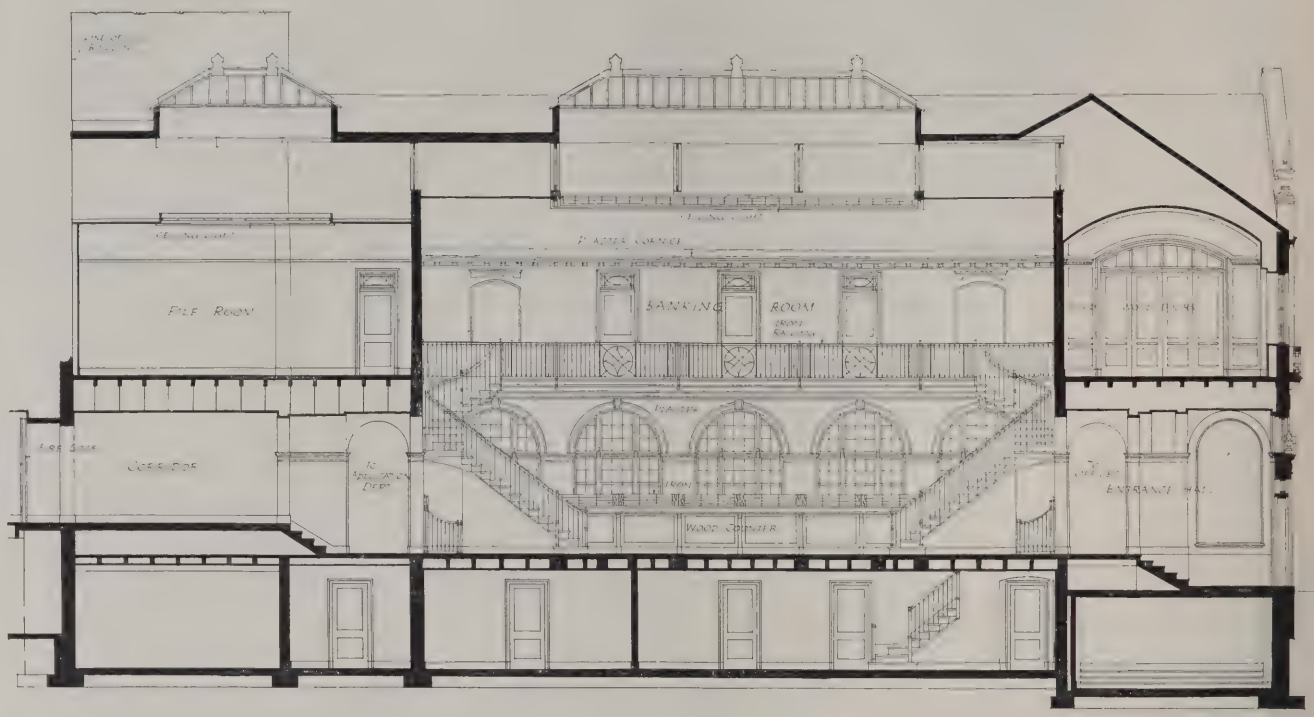

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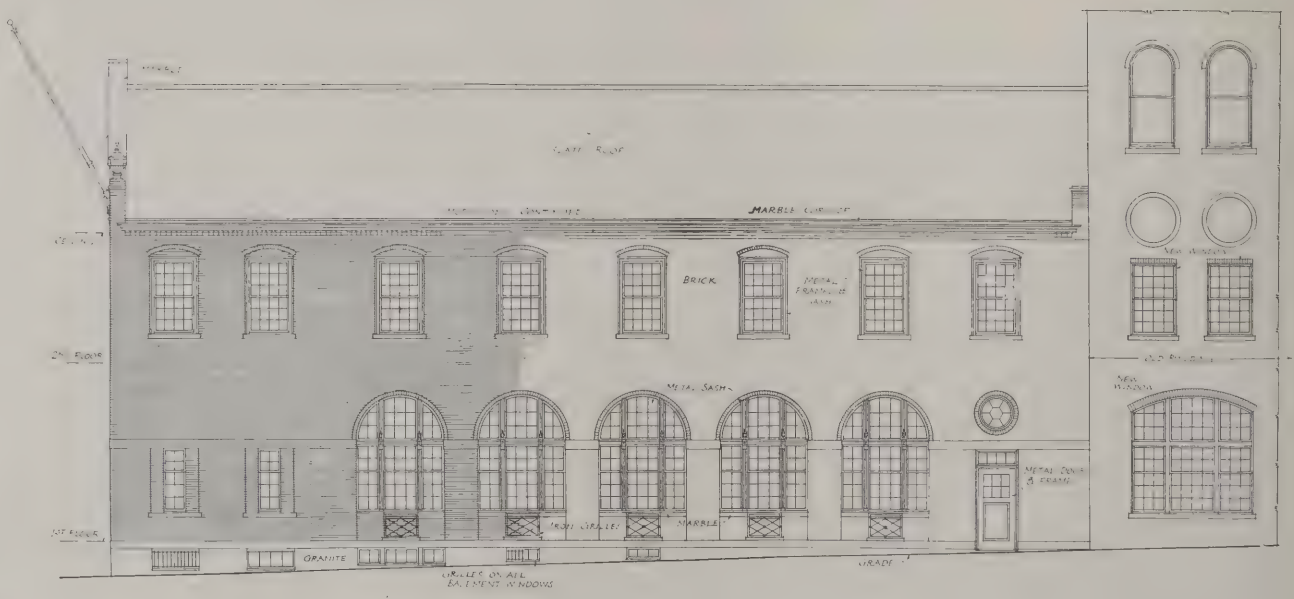

SIDE ELEVATION

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The ARCHITECTURAL FORUM DETAILS

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AN INTERIOR; MORRIS PLAN BANK, PROVIDENCE

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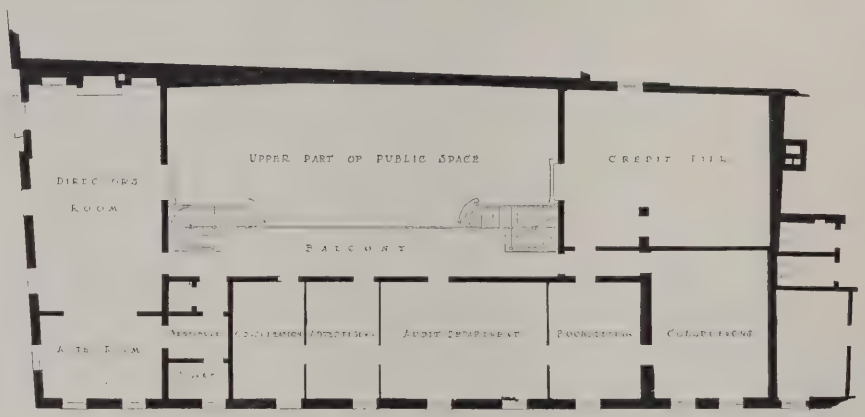
THIRD FLOOR



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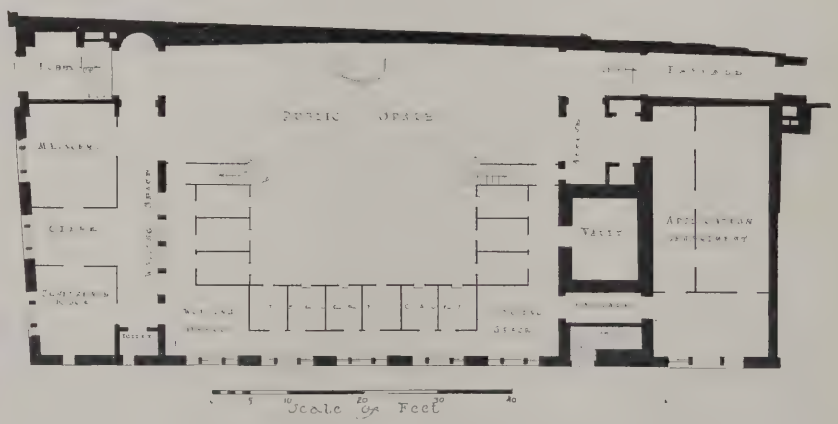

MAIN FLOOR

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WATERBURY NATIONAL BANK, WATERBURY, CONN.
CASS GILBERT, ARCHITECT

BANKING ROOM, WATERBURY NATIONAL BANK, WATERBURY, CONN.
CASS GILBERT, ARCHITECT

OLD INN AT WAKEFIELD, R. I.

Photos. Frances Benjamin Johnston

DETAIL OF END OF HOUSE, SHOWING SHINGLED HOODS OVER FIRST STORY WINDOWS
OLD INN AT WAKEFIELD, R. I.

SOME GREEK REVIVAL DOORWAYS IN OHIO

BY
THOMAS E. O'DONNELL

BETWEEN the years 1800 and 1850, the Greek Revival movement made its appearance, gained momentum, ran its course,—and declined. It was during this period that the "more progressive" builders championed the new style. In certain localities and with a certain class of people it became the vogue, just as today the Spanish style has become a fad. What was then prevalent in the east was also reflected in the middle west, particularly in Ohio, which had always been markedly influenced by eastern tradition. It was during this period that the old Colonial type of doorway, like the house itself, gradually began to conform to the new Greek style. The change did not take place all at once, but came about slowly through a process in which modified Greek forms were used here and there in the design of doorways in place of the old, freely interpreted classical forms of the colonial period.

The transition step from the Colonial to the more developed type of the Greek Revival was through the classical of the Roman variety. The classical details of the colonial period were very free interpretations of the Roman. During the classical revival period, which immediately preceded the Greek Revival, there was a conscious attempt on the part of the designers and builders to go back to and copy, exactly, the old Roman forms. Upon the advent of the Greek Revival, the process was one of substituting the Greek forms for the previously used Roman forms. By the time the Greek Revival was established in Ohio, the builders had, for their assistance, many carpenters' handbooks, such as those by Asher Benjamin. By the aid of these the builders were able to draw and execute Greek elements of architecture with some degree of understanding and accuracy. The Greek Revival doorways in Ohio are not lacking in variety. They range all the way from the very simple enframement to elaborate two-story "frontispiece" effects,—from where the doorway proper is a simply treated opening in a curtain wall, to where its architectural embellishments become so elaborate, extended and semi-detached, that it is difficult to tell, in some instances, whether the architectural features about the doorway belong to it, or to the body of the house. Again, in other types, it is difficult to differentiate between the ornamental decorative features of the doorway and those of the porch or shelter which accompanies it. The simplest of these is of the type represented by the side doorway of the Joseph Swift house (page 652), which once stood near Vermilion, a sketch of which is included here. It consists of a simple enframing of the door opening with battered jambs and simple architrave lintel, joined so as to give the effect of projections or "ears" at each side. The prototype for this is of course the frame of the windows in the Erechtheion, which was known to the builders through the measured drawings published by Stuart and Revett and which had been made available to them through copies in the carpenter handbooks.

A more typical treatment for a small Greek Revival doorway is that of simple pilasters and crowning entablature. Variety was obtained in these by varying the details and proportions, by means of which a surprising number of different designs were obtained. In the simpler types only the door proper was enframed. The next step was to include side lights. In some instances the pilasters were left very plain, while in others ornaments of Greek origin were used, as in the doorway of the old house on Buckeye Street in Wooster (page 650). This particular ornament, the honeysuckle, seems to have been a favorite with the Greek revivalists in Ohio, for it occurs frequently. This pilastered type of doorway was varied in still other ways. The simplest were those in which the pilasters had a very slight projection from the wall, thus giving a flat effect. In some cases a marked projection was given, thus imparting to the doorway a feeling of massiveness, and in others, columns were set in front of the pilasters, carrying a projecting entablature and a flat roof or pediment, thus forming a porch over the doorway. Many examples of this type are to be found in Ohio, especially in the larger town houses.

A characteristic doorway of the Greek Revival period is the recessed type. Here again there is a great variety, ranging from the simple recessed opening to the two-story recessed "frontispieces," features of the larger houses. The simple doorway of an old house in Delaware exhibits an opening filled with a door flanked by two sturdy Greek Doric columns, and supporting a simple lintel. In other and better examples this simple lintel is replaced by a full entabature, set with the architrave and frieze flush with the wall. All three of the Greek orders are found used in doorways of this type. In some of the finer doorways, the door proper is flanked by both columns and pilasters, the pilasters serving as a finish to the edges of the wall openings. In some cases the pilasters were set out at some distance, thus adding depth and massiveness to the doorways. The doors of the Allen (page 650) and the Wilson-King (page 651) houses, Chillicothe, are examples.

Recessed doorways were not invariably of the single-story type. For very large and more elaborate houses, the wall areas above the doorways seemed too heavy and blank for the single openings below. There was a desire to lighten the upper portion, also to give emphasis to the entrance. This was done very effectively by making the recessed portion carry through two stories. A whole series of these are to be seen in certain large towns in

A more elaborate type of recessed doorway, worked out in stone. From the Allen house, Chillicothe, O. Here the entablature is carried upon two columns that are flanked by pilasters, all of which are set flush

A typical Greek Revival entrance porch in the "Ionic" style. From the Wallace house, Chillicothe, O. The architectural features frame the doorway, as in the pilastered treatment, but project to form a porch

A typical treatment of the simpler Greek Revival doorway, especially those of small frame houses, is exemplified by this doorway from an old house on Buckeye Street, Wooster, O. It consists of flat pilasters and a well defined entablature

A massive type of Greek Revival doorway, found in larger houses, showing more of the real spirit of the period than those often seen. The proportions are those that one would expect to find in stone. From an old residence in Warren, O.

The doorway of the Andrews-Case house, Delaware, O. An example of the very late, over-massive Greek Revival doorway of the two-story type

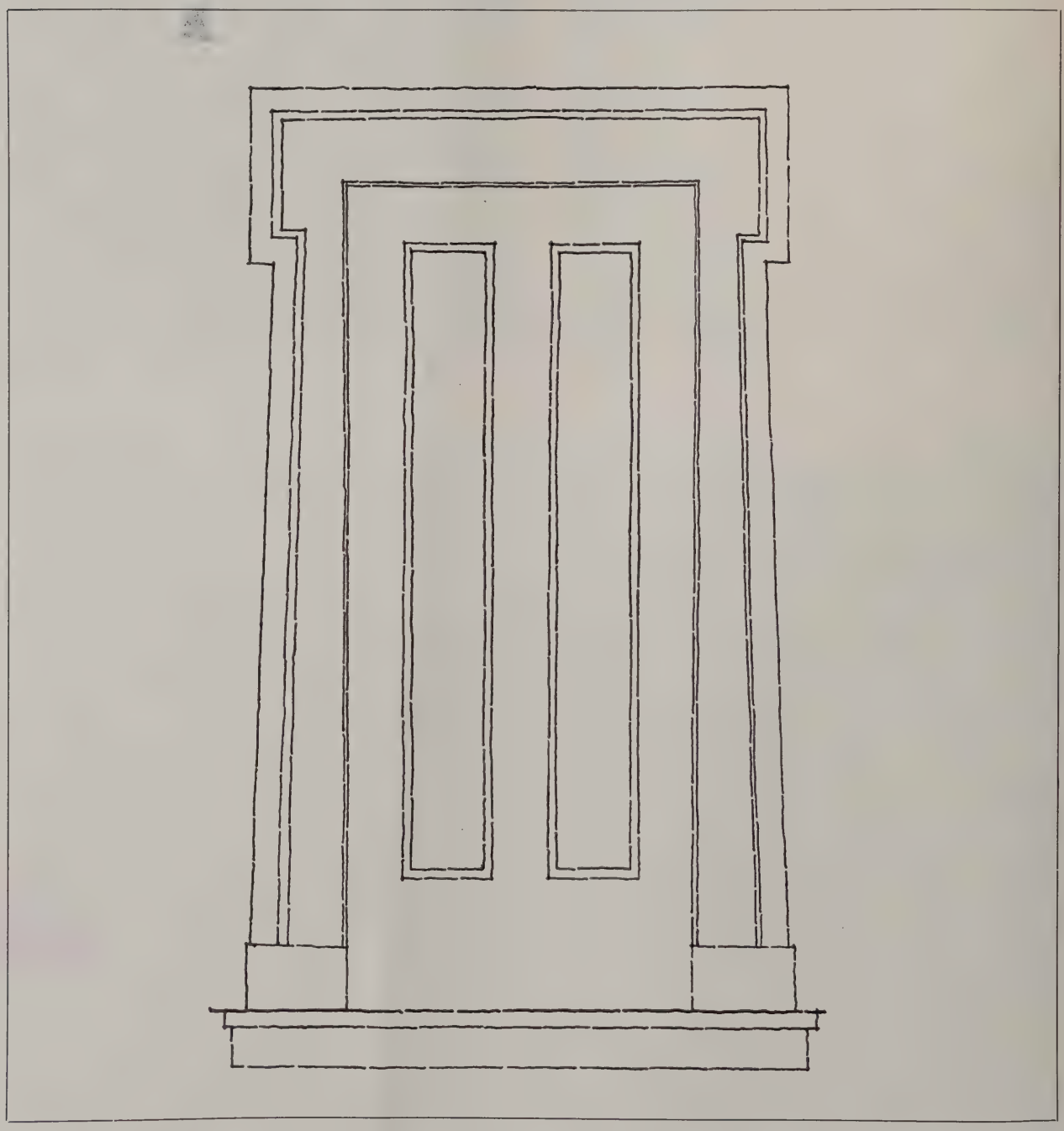
The doorway of the Atwood house, Chillicothe, is representative of the later two-story type. The lower portion was usually of the same design as the one-story type.

Recessed doorway of the Wilson-King house, in Chillicothe. A larger and more formal type of Greek Revival doorway, built entirely of stone. In this case the whole feature is set slightly forward.

An old doorway in Chillicothe that is typical of the massive Greek Revival recessed doorway. The opening is here embellished by a wooden entablature, which is carried by two wooden columns.

Ohio. In Chillicothe there are some particularly fine examples, such as the old Joseph S. Atwood house (page 651). These are especially graceful and pleasing in design. The Andrews-Case (page 651) house, in Delaware, is typical of the heavy, massive examples, and is lacking in that refinement and delicacy of line which are expected in residential work. In all of these the Greek spirit and the use of certain Greek forms are evident, and the builders are to be commended in that they were not content with imitating Greek buildings, but tried to get at the spirit of Greek work and to adapt the forms to their own necessities. Houses built in this manner were common in Ohio in the 'forties and mark the climax of the Greek Revival movement there.

Although lacking in much of the grace and refinement characteristic of the Colonial, the Greek Revival doorways in Ohio are not without interest and charm. Unlike the Colonial types in Ohio, they passed through a real development, and many new and original designs were worked out. It is because of this great diversity of design that these old Greek Revival doorways offer much in the way of suggestion and inspiration for modern work in the middle west, where they may justly be considered native regional types possessing particular interest.



The Greek Revival doorway in its simplest form as found in the Joseph Swift house, which once stood near Vermilion, O.

ENTRANCE OR MAIN ELEVATION

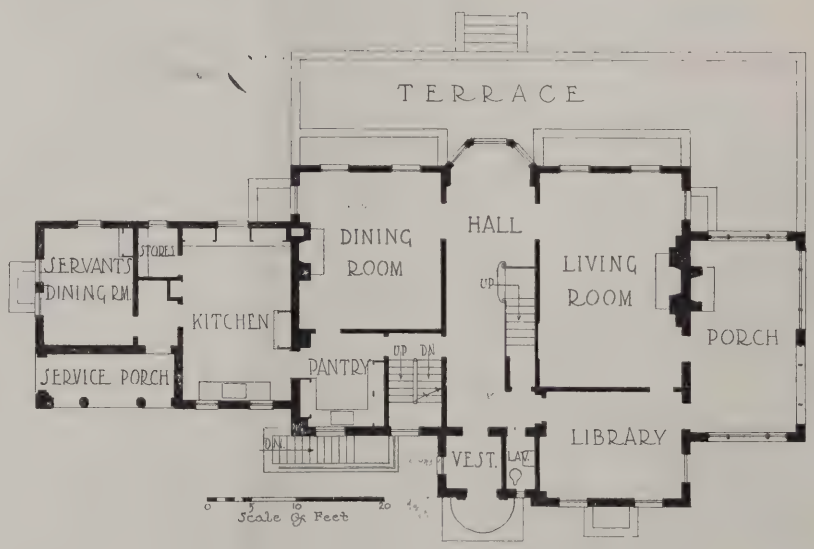
Photos. George H. Van Anda *Plans on Back*

GARDEN ELEVATION

HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.

PHELPS BARNUM, ARCHITECT

SECOND FLOOR



FIRST FLOOR

PLANS: HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.

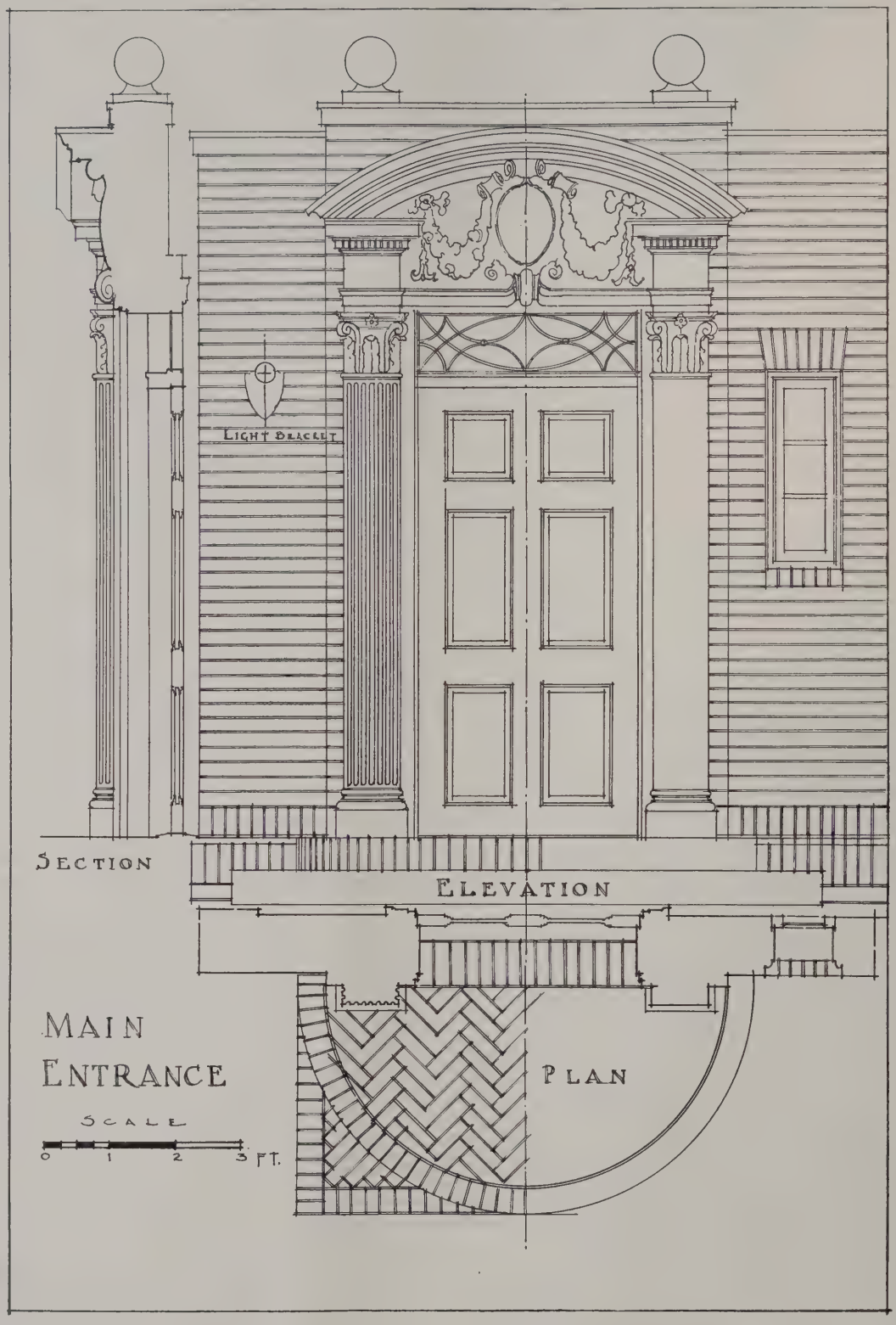
PHELPS BARNUM, ARCHITECT

Details on Back

ENTRANCE DOOR

HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.

PHELPS BARNUM, ARCHITECT



HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.
PHELPS BARNUM, ARCHITECT

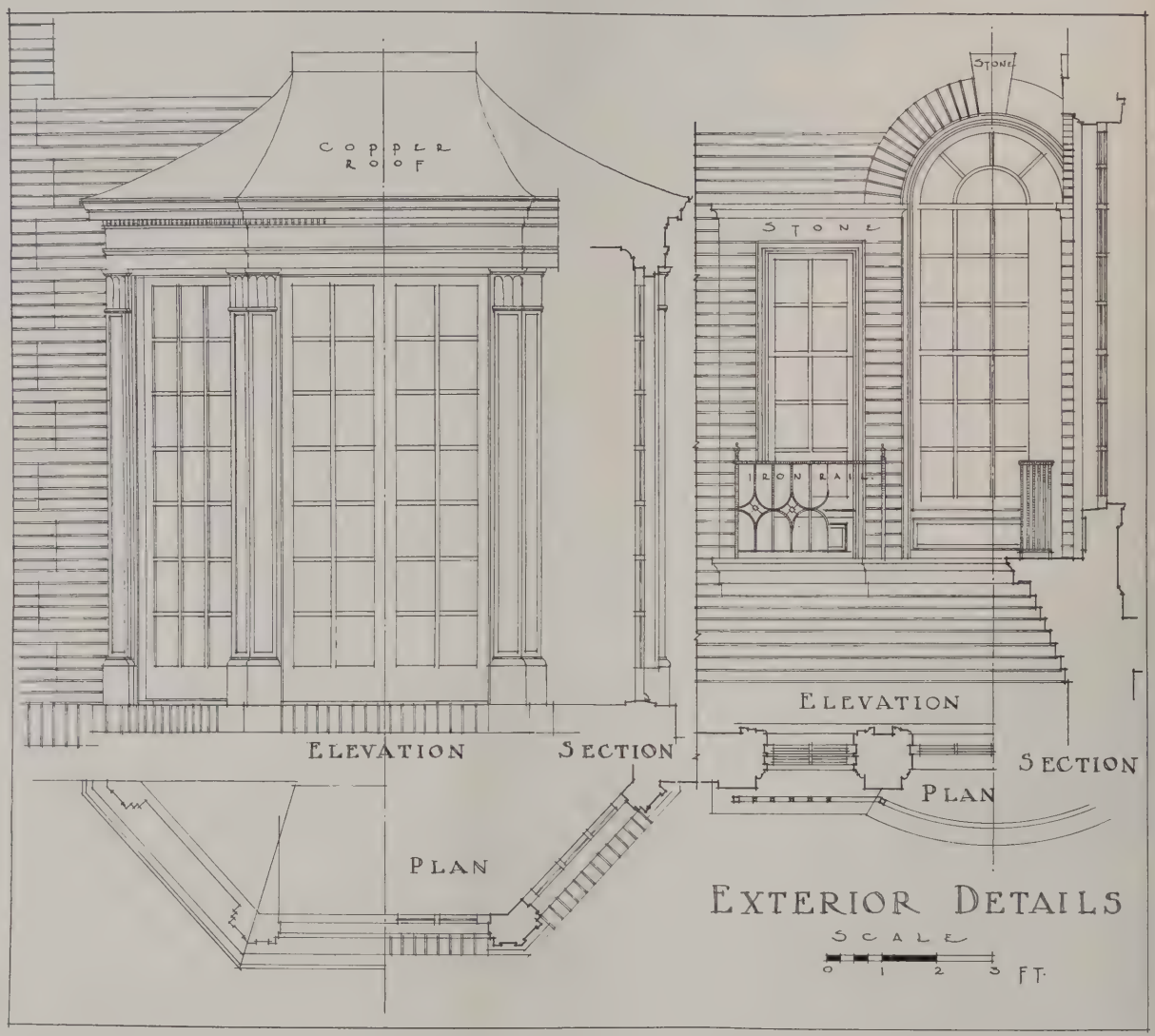
LIVING PORCH AND GARDEN
HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.
PHELPS BARNUM, ARCHITECT

Details on Back

CORNER OF ENTRANCE HALL BAY

HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.

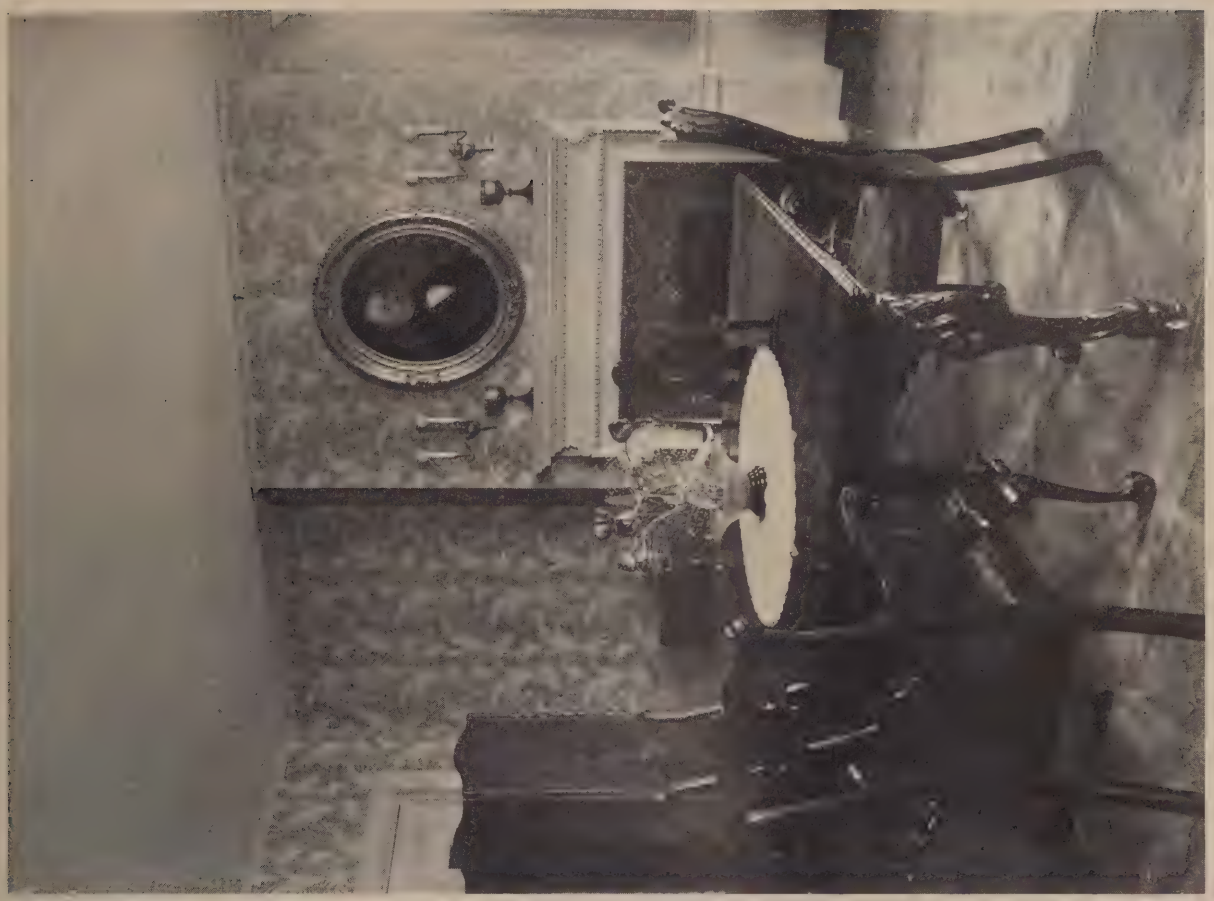
PHELPS BARNUM, ARCHITECT



DETAILS, ENTRANCE HALL BAY AND WINDOW ABOVE LIVING PORCH

HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.

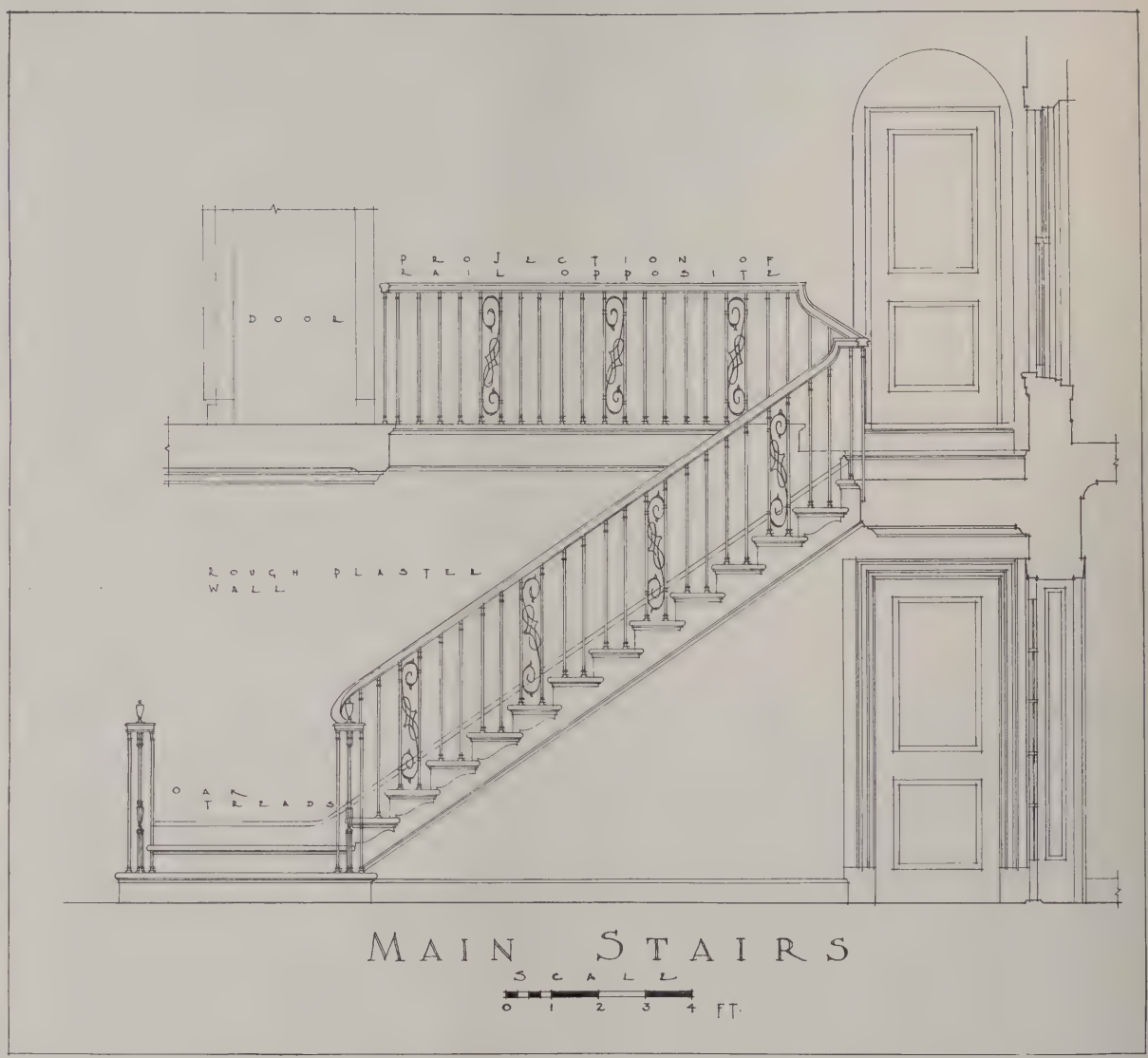
PHELPS BARNUM, ARCHITECT



DINING ROOM

LIVING ROOM

HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.
PHELPS BARNUM, ARCHITECT

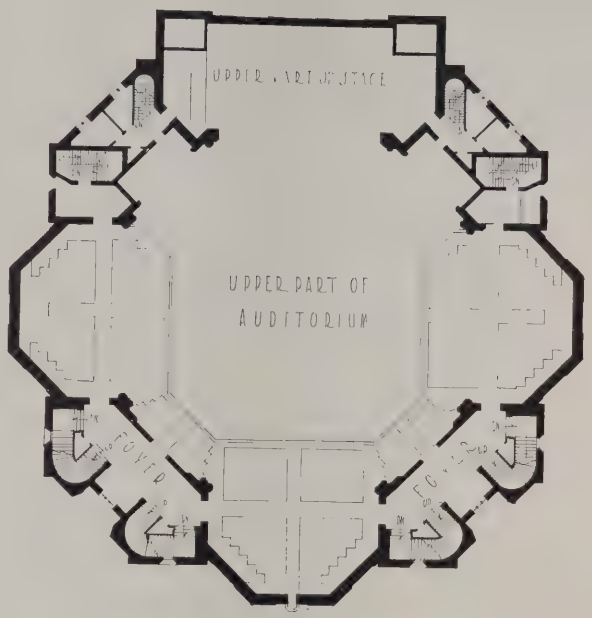


HOUSE OF E. H. BAKER, ESQ., GREENWICH, CONN.
PHELPS BARNUM, ARCHITECT

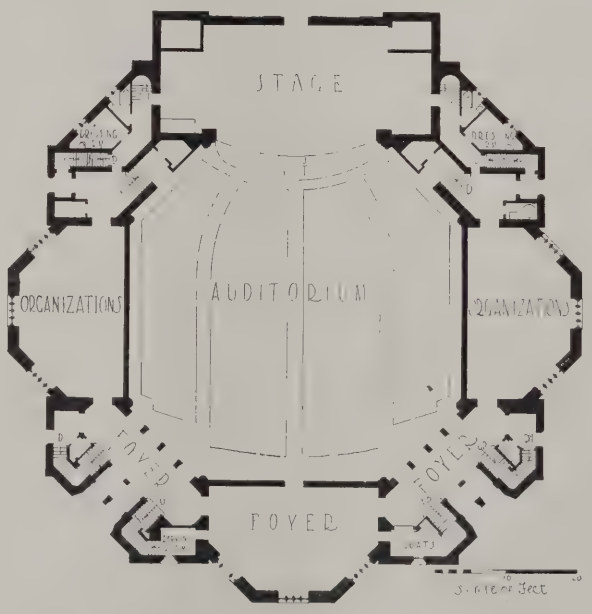
Photos. Paul J. Weber

Plans on Back

WILLIAM B. IRVINE AUDITORIUM
UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA
HORACE TRUMBAUER, ARCHITECT



BALCONIES



MAIN FLOOR

PLANS: WILLIAM B. IRVINE AUDITORIUM
UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA
HORACE TRUMBAUER, ARCHITECT

ENTRANCE, WILLIAM B. IRVINE AUDITORIUM
UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA
HORACE TRUMBAUER, ARCHITECT

INTERIOR, WILLIAM B. IRVINE AUDITORIUM
UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA
HORACE TRUMBAUER, ARCHITECT

THE ARCHITECTURE OF DENMARK

PART II

BY

DR. TYGE HVASS

BY decree of Frederick V, Amalienborg Palace was erected in Copenhagen in the decade from 1750 to 1760, under the supervision of the Danish architect Eigtved. This palace consists of four identical Rococo buildings, arranged around an octagonal plaza. On command of the king, these four palaces were erected by four of the great noble families, and the king insisted, although reciprocating with certain tax exemptions, that they should be constructed in accordance with the architectural plans of Eigtved which had received his approval. About 1770 the architect Harsdorff, influenced by the dawning classicism, connected two of the palaces with a colonnade, in simple classical style, with Ionic columns. By this device the palace plaza was more completely enclosed, its octagonal shape was further emphasized, and the impression of spaciousness greatly accentuated. Amalienborg is still the residence of the Danish kings, and it is conceded that the palace buildings form one of the most striking groups in Europe.

The story of modern architecture begins about 1830, with the ebbing of the influence of the Empire period, with Soane in England, Schinkel in Germany, and Bindesboll in Denmark feeling their way toward use of new styles outside the outworn Empire. This attempt constituted in itself a new style. It indicated a break with the orthodox, an identification with earlier forms, and a subjection to the experience and genius of others. Archæology came to be recognized as a science, and it laid a cold hand on architectural experiments or originality. The academies and schools taught use of certain conventional styles, and assigned tasks and problems which had to be worked out in accordance with the dictates of those styles and within the artistic limits of a given century. These theoretical problems to a large degree did violence to the artistic actualities they were supposed to reproduce. Architects not only submit to the motifs taught in the schools and guide books, but seek them everywhere. They try their hand at Renaissance, Baroque, Rococo, Romanesque and Gothic styles, and from all sides they are deluged with illustrative material in the form of books of plans and of photographs, prints, and even post cards.

We have noted Bindesboll as one of the first who sought to break away from the use of the conventional Empire style. Around 1840 the influence of classicism was ebbing away, but under the genius

Photos. Courtesy American Scandinavian Foundation

Church at Lyndelse, Denmark

of such architects as Hansen it had meant immeasurably much to Denmark. To Hansen we owe such great architectural monuments as Christiansborg Palace, Our Lady's Church, the Copenhagen Court House, and many other public buildings. His edifices were correct, dignified,—and academic. The possibilities of this Neo-classical style soon appeared to be exhausted, and architects turned hopefully to new experiments. In 1838 Thorwaldsen's Museum was erected after the plans of Bindesboll. It was the last major effort of the Empire period, an original and splendid conclusion to that classicism which erected so many proud memorials to itself in Danish architectural history. Thorwaldsen's Museum, however, was a unique effort of Bindesboll, and it stands quite apart from his other and later buildings which were quite styleless and characterized by a strict economy of line and by the extent to which proportions and construction determined the form. Bindesboll can scarcely be said to have established a school, for he was professor at the academy for but one year; but it was his pupil, Herholdt (1818-1902) who, under the inspiration of Bindesboll's personality and genius, directed Danish architecture into new and independent channels. Herholdt gave to Danish architecture new points of departure and the possibility of more healthful and natural development. The old springs had dried up, but he knew the way to fresh springs where many generations might drink of the waters of inspiration. The springs to which he turned flowed bountifully from the Danish soil; it was back to the old Danish domestic architecture that he led the way. His most important achievements,—the library of the University of Copenhagen and the Copenhagen railroad station, now no longer standing, were in many respects path-breaking for Danish architectural development. For even though these buildings show the influence of north Italian architecture, both in conception and in fulfillment, they show a rare freedom and independence, which have exerted a profound influence on the course of Danish architecture. Here for the first time we can discover a positive national note in Danish architecture. And yet, synchronously with this development of national traditions, there was a constant influence from Italy, still the goal and training place for Danish artists. It was always the north Italian Romanesque and Renaissance art which they sought to re-

Church at Horne, Denmark

Old Gate Tower, Stege, Denmark

produce and to interpret; not Classical or Baroque.

The most representative and incomparably the best work of this school is the famous Copenhagen Town Hall of Marton Nyrop. Work upon this magnificent building was begun in 1893 and concluded ten years later. Despite the Italian detail work, and the Veronese assembly room, the building is unmistakably national in character, and due to its democratic intimacy and simplicity it has remained one of the most popular buildings in the country. This Town Hall crystallizes a generation of devoted study of old Danish domestic architecture. All that is most characteristic and national in the great Renaissance palaces, the old churches, and the memorial houses, is reincarnated in this architectural masterpiece. The same genius is also evident in the use and combination of the different building materials. Each material has been used in accordance with individual demands and possibilities, and as a result the building is an example of a technical mastery of material unparalleled in any other work of the entire modern period. Nyrop's masterpiece has become a point of departure and a model for a new school of architecture in recent years. The Town Hall has proved a source of inspiration for Danish craftsmanship, and will continue to do so.

More recent architectural developments, however, have taken quite another direction. Influenced by the work of Morris in England and Schultze-Naumburg in Germany, Danish architects became aware of the significance of the building as a whole, as a living and unified organism, of the character of the building in relation to its environment, and of the logic of the use of materials and plan in relation to function. Once again the architects turned back to the older Danish buildings, not, however, to the splendid castles or elegant manor houses, but to the individual burgher homes. In the beginning, as was quite natural, architects attempted to borrow and to copy motifs from the older buildings, but it was not long before a more independent attitude was developed, and there came a realization that it was possible to fit the individual house into the Danish landscape or the old Danish towns without resorting to a blind imitation of old styles. This attitude obtains at the present time and is the characteristic note in present-day Danish domestic architecture. In 1906 the eminent art critic, Wilhelm Wanscher, published

Roskilde Cathedral, Denmark

Arreskov Mansion, Denmark

his "Æsthetic Interpretation of Art," and his volume communicates a lively understanding of what art actually is. Through his books and lectures Wanscher has influenced a group of architects of his own age,—the so-called "free" architects, who withdrew from the Academy of Art, then under the leadership of Kampmann and Nyrop, as a protest against it. The leading spirits of this young group were P. V. Jensen-Klint, Carl Petersen, Baumann and Ivar Bentsen. Jensen-Klint, the oldest of the "free" architects, has made a signal contribution by his zeal in encouraging the old craftsmanship through his numerous writings and lectures. But it is in his architecture, itself independent and original, that he has given best expression to his principles. This is especially noteworthy in his adaptation of the old country church architecture to modern uses, the most distinguished example of which is the magnificent Grundtvig Church of Copenhagen, not yet completed.

For a number of years the ideals of the "free" architects dominated the shifting currents of Danish architecture, and though they had at first repudiated the Academy, they eventually captured it. When Carl Petersen died he was a professor at the Academy, and Ivar Bentsen occupies this position today, and it was Carl Petersen, himself not remarkably productive, who came to exert the greatest influence on the direction of contemporary Danish architecture. A direct product of his influence is the new Police Headquarters in Copenhagen. To Kampmann was assigned the task of carrying this great piece of work to conclusion, but swept away by his enthusiasm for the ideas of the modernists, he allowed the younger group a free hand here. The artistic work on this monumental building is that of Aage Rafn; the building itself is a reproduction of classical models,—part of a general European movement which seems already to have run its course.

Despite all of these changing interpretations and shifting currents, Denmark has fortunately escaped, during these hectic years, most of the architectural eccentricities and abnormalities which have appeared in other countries. The explanation of this good fortune is not easy to discover, but it is probably to be found in the sober, conservative and democratic character of the Danish people and in the fact that Denmark is so small that each individual artist is subject to an alert and highly penetrating criticism.

Cathedral at Ribe, Denmark

Photos. Paul J. Weber *Plans on Back*

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

SECOND FLOOR

GROUND FLOOR

PLANS: CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

Details on Back

MAIN ENTRANCE AND STEPS

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

DETAILS of MAIN ENTRANCE DOORS & STEPS at WEST END of CHURCH

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

No. 86

NOV. 1928

Details on Back

NORTH TRANSEPT

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

NOV. 1928

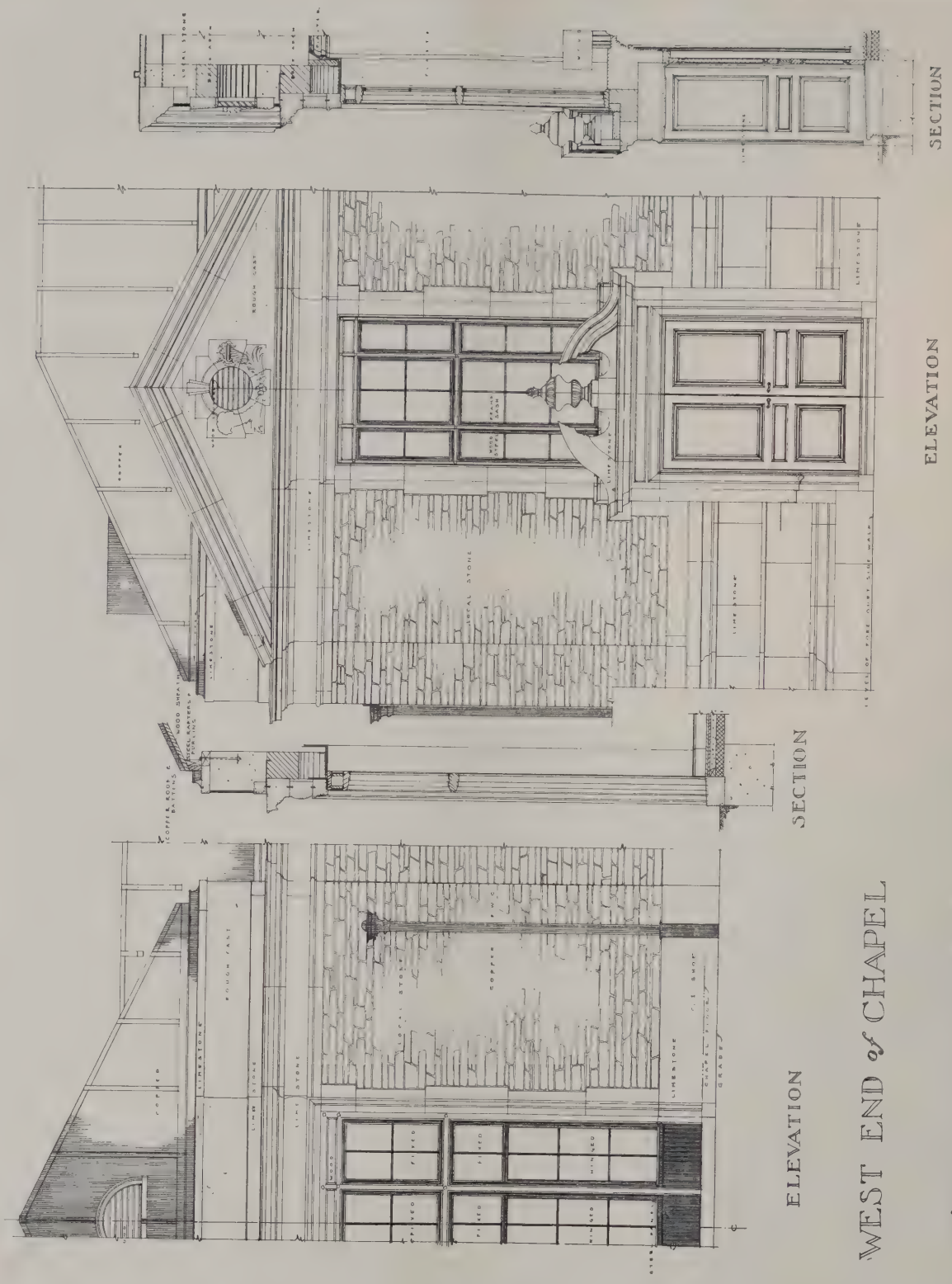
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

No. 87

The Architectural Forum Details

ENTRANCE TO NORTH TRANSEPT
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT



NOV 1928

DETAILS, ENTRANCE AND WEST END OF CHAPEL
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

No. 88

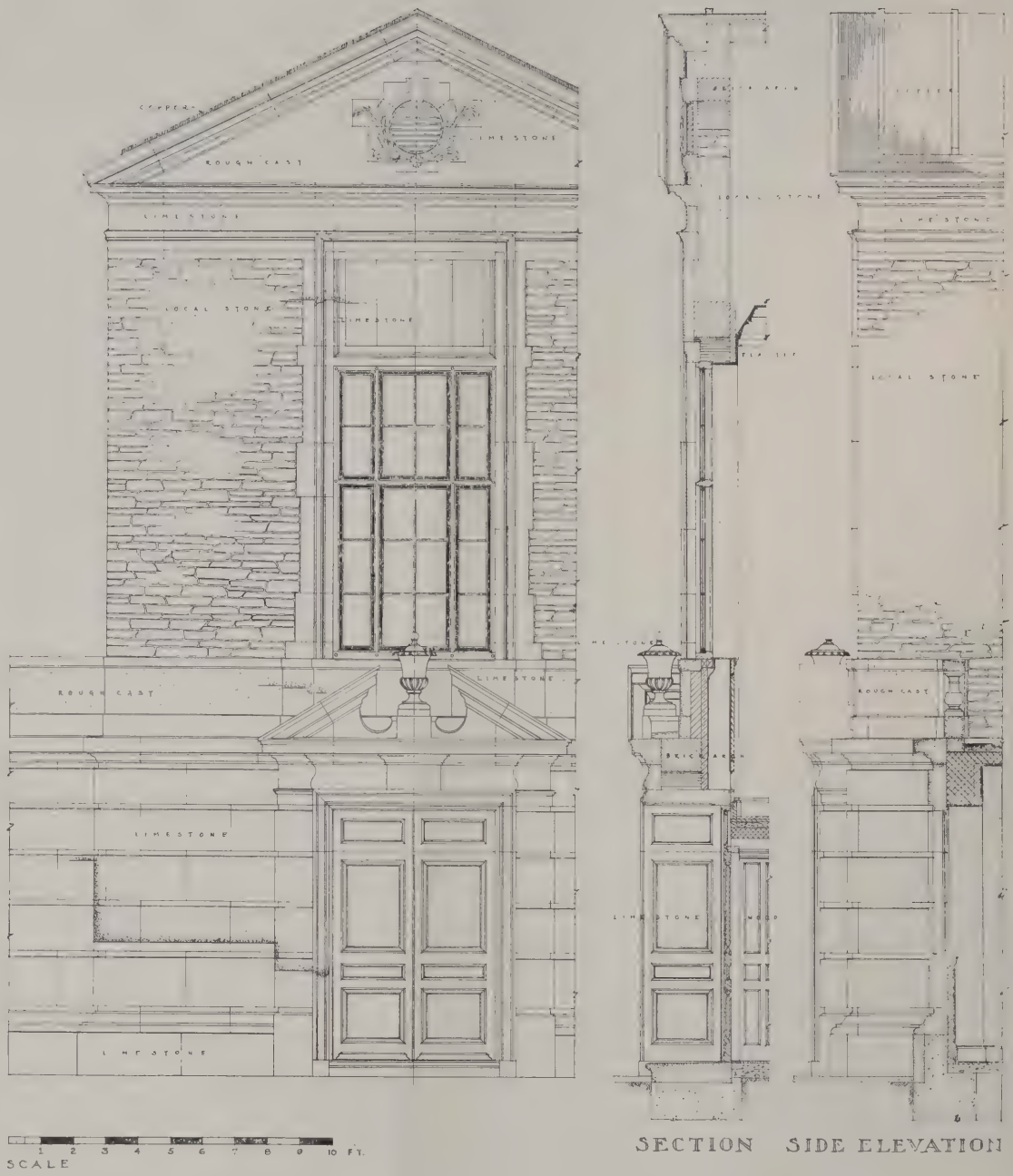
The Architectural Forum Details

Details on Back

ENTRANCE TO THE PARISH BUILDING

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT



MAIN ENTRANCE DOORS TO PARISH BUILDING

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

NOV. 1928

No. 89

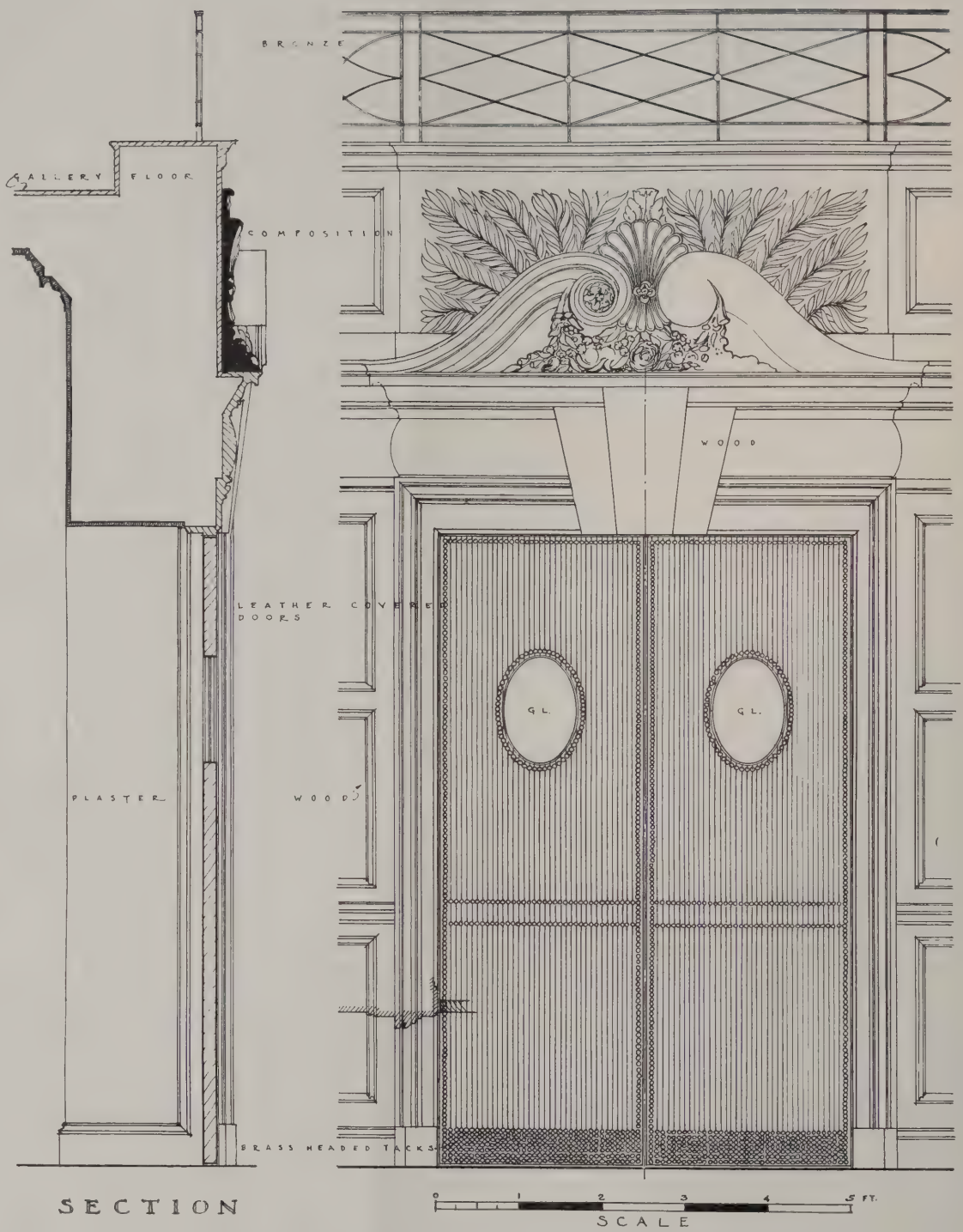
The Architectural Forum Details

Details of Door on Back

NAVE, FROM THE CHANCEL

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT



DOOR FROM NAVE TO MAIN LOBBY

NOV 1928

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

No. 90

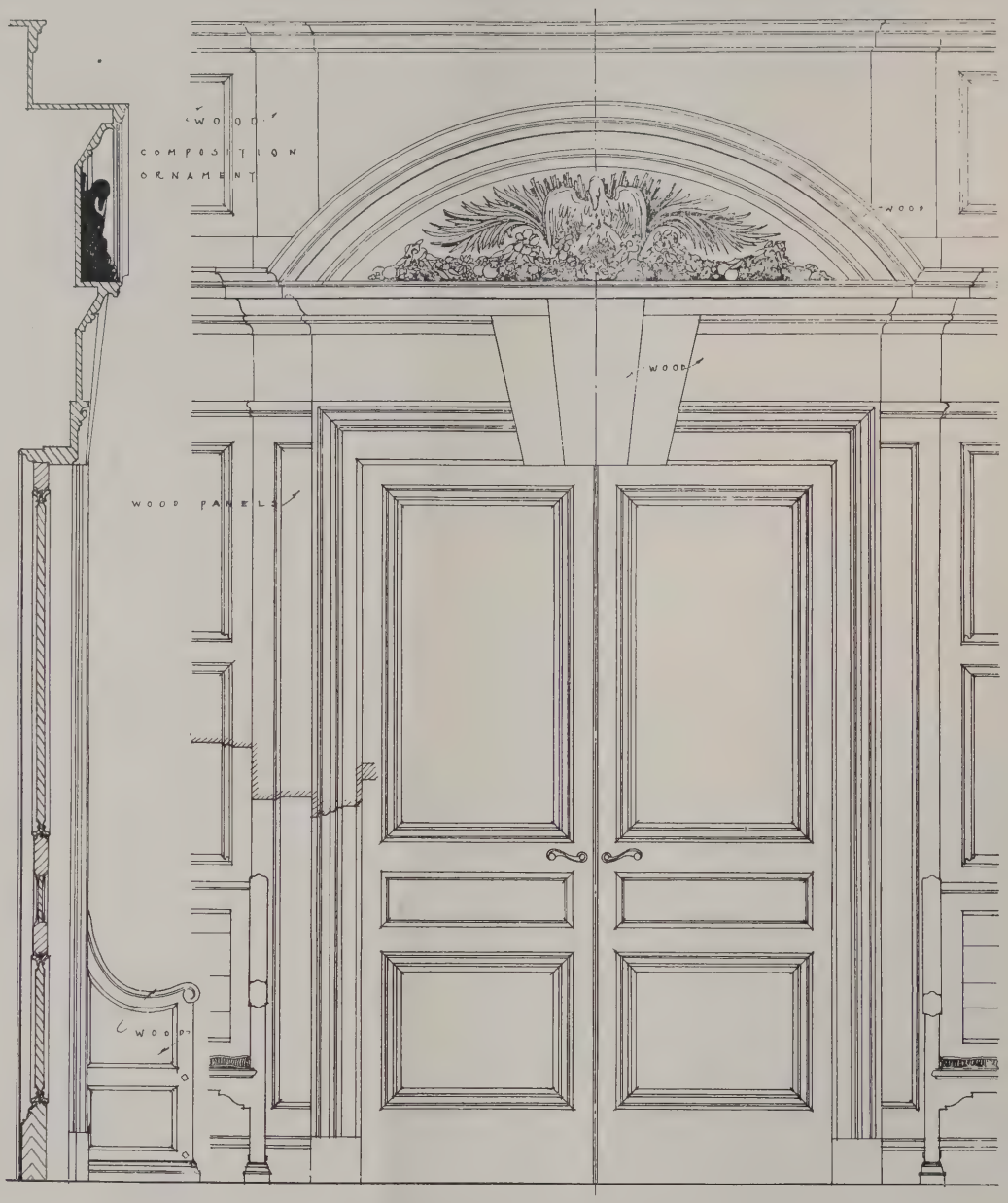
The Architectural Forum Details

Details on Back

INTERIOR OF THE NORTH TRANSEPT DOOR

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT



NORTH TRANSEPT DOOR

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

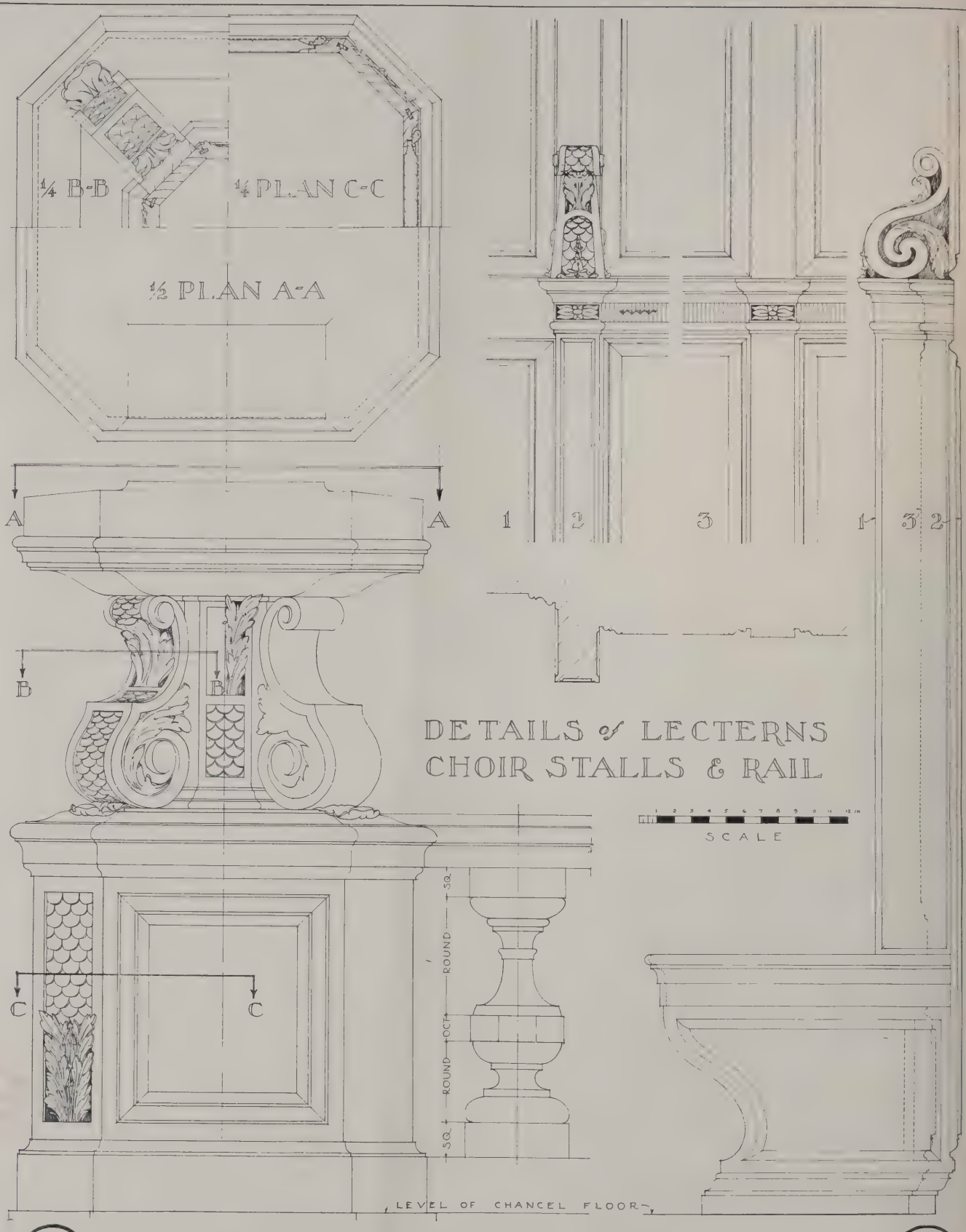
NOV 1928

No. 91

The Architectural Forum Details

Details on Back

LECTERN, RAIL AND CHOIR STALLS
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT



DETAILS of LECTERNS CHOIR STALLS & RAIL

NOV 1928

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

EDMUND B. GILCHRIST, ARCHITECT

No. 92

The ARCHITECTURAL FORUM DETAILS

CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.

BY
HAROLD D. EBERLEIN
EDMUND B. GILCHRIST, ARCHITECT

THE new buildings of the Unitarian Society of Germantown, Philadelphia, aptly point the perennial value of good manners. Good manners are always good and always pleasant, no matter what minor differences occur between the expressions of one age and those of another. And architecture, after all, is or ought to be a true embodiment of the behavior and moral standards of the particular epoch to which it belongs. Of these buildings just finished for the Unitarian Society, the church itself, of course, is the chief feature of the group. But, besides the church, the group includes the pastor's study; a parish hall with committee and classrooms, a completely appointed auditorium with an adequate stage, and a fully equipped kitchen with a large pantry adjoining; and, in the farthest member or wing, a chapel and a library, in the latter of which will be placed the books and a number of other articles that once belonged to Joseph Priestley.

When the Society decided to abandon its former buildings on Walnut Lane, and erect on the Lincoln Drive a group more suitable to its needs, there was plainly expressed the desire that the new church edifice, together with its adjunct structures, should not display an emphasis of markedly ecclesiastical character. It preferred rather that there should be, so far as possible, a domestic quality and a general aspect of dignified but cordial hospitality. An explicit requirement of this sort, laid down at the outset, naturally had a distinct bearing on the choice of design. Any phase of Romanesque or Gothic was thereby at once ruled out of the field of consideration. At the same time, certain conservative sentiments had to be taken into account, and the Society was unwilling to commit itself unreservedly to any program of out and out modernism.

Mr. Gilchrist has reached a peculiarly happy solution of the somewhat unusual requirements proposed to him. He has not attempted to effect one of those unconvincing, half-digested compromises that occasionally thrust themselves on the view,—compromises that seem to hesitate irresolutely between rigid adherence to tradition and the unfettered license of modernism. In adopting a mode undeniably reminiscent of Sir Christopher Wren's usage of religious building, he has shown due appreciation of a fact, too often ignored,—that tradition rightly understood and employed is always a flexible and accommodating instrument. It might, perhaps, be more correct to say that the architect, in this instance, has used Wren's mode, not as a model to pattern after as far as circumstances would consistently admit, but rather as a point of departure, a robust stock on which to graft adaptations germane to the occasion, exercising therein a large liberty of interpretation,—and this has, in fact, been well done.

Wren was inherently a classicist by temperament. He was also an eclectic. To whatever extent one may or may not be inclined to designate him a stylist, he was certainly not a narrow purist with an obsession for meticulous observance of traditional proprieties. His eclecticism is clearly evident in his habitual choice and combination of elements drawn from divers sources. Upon a stock of pure classicism, wholly congenial to his natural temperament and mental attitude, he grafted the Baroque characteristics, which he had assimilated through French and Dutch channels, and then graced them with exuberant elegancies in the fashion of Grinling Gibbon. In this process of selection and combination he relied, not upon the sanction of established and approved precedent, but upon his own innate sense of fitness and proportion. It was this independence of action that gave Wren's work much of its freshness and vitality. But Wren, the stylist and eclectic, was conspicuously an embodiment of the Renaissance spirit, the spirit that dominated the age in which he lived. The humanism, the classic love of logic, order and symmetry, and the graceful perspicuity that were part and parcel of the Renaissance spirit, were also part and parcel of Wren's very nature. The mysticism, the spiritual ecstasy, the romantic exaltation, the ecclesiastical symbolism and imagery, that we customarily associate with the middle ages, touched no responsive chord in Wren's mentality. His age was the age of Doctor Harvey, of Sir Isaac Newton, of Galileo, and he marched wholeheartedly with the spirit of his age. How cold and lacking in appreciation was Wren toward all things Gothic and mediæval,—he was temperamentally incapable of understanding them,—may be seen at a glance by his work at St. Mary's, Warwick. He was altogether preoccupied with classicism and the manifestations of its strictly material and visibly human element.

No one would dream of attributing to Wren's churches a shadow of the spirit of ecclesiasticism. St. Stephen's, Walbrook, for example, is instinct with consummate grace, but it contains not a vestige of that mystic spirituality we inevitably feel pervading Westminster or York, Gloucester or Durham, Chartres or Bourges or, for the matter of that, San Zeno at Verona. To quote Wren's own words, he built his churches in what he called "a good Roman style" as distinguished from "the Gothlike rudeness" of the modes in which the mediæval builders worked. Wren's London churches are superb examples of Renaissance architecture and, as such, are worthy

Photos, Paul J. Weber

DETAIL, WEST END OF NAVE
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

DETAIL OF THE CHANCEL
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

Detail of Tower and North Entrance

of all honor and deserve the most scrupulous preservation,—but ecclesiastical in spirit they are not. Since the Unitarian Society of Germantown expressly desired to eliminate the element of ecclesiasticism in this new building, and to emphasize rather the humanistic quality, what more fitting precedent could be found as a point of departure than the ideals embodied by Wren? Temperamentally they expressed the requirements of the occasion. The event, likewise, shows how congenial was this vein of expression to the architect. But, while accepting the spirit of the prototype, the architect, like Wren before him, has maintained his independence of interpretation. By so doing he has ensured that vital freshness that a too close observance of the letter inevitably destroys.

The exterior walls of the group are built of rubble-faced local gray ledge-stone, laid in thin courses with a horizontal accent; the outer walls of the aisles, the base courses of the parish buildings, and all the trim are fashioned in Indiana limestone. The rubble-faced clerestory walls are divided into bays by simple limestone pilasters whose equally simple caps die into the coved cornice in a very ingenious manner which finds its precedent, if any particular precedent it has, in the supple inventiveness of Baroque practice in seventeenth-century Italy, or the scarcely less adroit manipulations devised by French genius at the time of the Directoire. Were any disapproval to be voiced on the score of material, it would touch the disparity between the homespun quality of the rubble wall surfaces and the silken suavity of the limestone. The quantity of carefully dressed limestone, however, is so preponderant that the total effect carries the tone of complete and polished refinement. As a matter of fact, the rubble work is of exceptional excellence; the only touch of improvement to be suggested is that the rubble portions of the exterior be given a cement wash in accordance with the architect's wish. This would ensure more uniformity of finish without marring the very desirable element of contrast intended. After all, it is well to keep in mind the principle here exemplified in an unobstrusive way,—a principle well understood and acted upon by the old Italian builders, —that wall surfaces of any considerable extent admit great latitude in the diverse sorts and qualities of material used in their construction, so long as all the penetrations and all the edges of the mass are uniformly finished with a superior material and fashioned with decorous precision.

The tower and spire, from whatever point one views them, constitute a peculiarly felicitous and engaging composition. The lattice pattern in the panels of the octagonal drum at the base of the spire, and the vertical ribs of the spire facets, give a pleasant note of articulation that will become increasingly agreeable as the copper with which they, like the roof, are covered assumes its wonted weathering from oxidation. The bell stage, with its surmounting adornment of panels, pediments, carved scrolls

and urns, in a very convincing way combines serene, classic dignity with that spirit of blithesomeness which is both legitimate and desirable. The louver "boards," it will be noted, are of stone. Throughout the group, all the doors and the mullions of the square-headed windows are of oak, which is permitted to display its real color and character, undisguised by any of the usual and objectionable stains, fillers or finishes, save for a very slight fuming that merely tempers the newness until time and weather do their work. A narrow black band, next the glass, accentuates the character of the mullions and transom bars and adds sparkle and definition.

The interior of the church is no less arresting in its thoroughgoing distinction than is the exterior. In point of both material and color, the entire composition conveys to an unusual degree an unalloyed sense of satisfaction. All the woodwork is of oak, allowed to remain in its native state except for the slight and practically negligible treatment previously mentioned. To speak of *all* woodwork really means most of the interior. The walls are completely paneled up to the bases of the clerestory windows; the square piers between nave and aisles are encased in paneling, the pilasters defining the clerestory bays are of oak, and so are the cornice and the beams of the ceiling. Throughout the interior, the detail of the woodwork closely follows the manner of the late seventeenth century in England. As this mode was universal in the houses of that period as well as in Wren's churches, it serves to emphasize the domestic quality of the structure in a quite consistent manner, which was exactly what the clients wished. The same scheme of woodwork, it should be added, is continued through the other buildings of the group. In pleasant harmony with the dominant tone of the oak, the plaster of the clerestory walls is tinted a pale cream. Between the beams of the ceiling the panels are covered with silver paper coated with shellac, the result being a dull gold tone. The carpet and cushions of the pews are of rich red, and the swinging doors at the end of the church are covered with red leather and studded with brass-headed nails.

In harmonious furtherance of the color treatment, we may look to the east window. It is, indeed, with its glowing reds and blues, the very focus and climax of a consistent color plan. This memorial window, a work of great beauty, vindicating the ability of the modern glass craftsman, is an admirable conception designed and executed by Niccolo d'Ascenzo. Its source of inspiration was one of those rarely graceful Renaissance windows in the Certosa at Val d'Ema, just outside of Florence; nothing could be more appropriate or thoroughly in agreement with every feature of a building in which the best late Renaissance tradition is so happily embodied. No one will be disposed to cavil at the presence in the south transept of the painted window with Gothic tracery and stained glass, or the two stained glass lancet windows in the clerestory wall of the same transept. They are memorials brought from the former edifice.

Tower and Entrance from the South

DETAIL OF TOWER
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

DETAIL SOUTH ENTRANCE TO NARTHEX
CHURCH OF THE UNITARIAN SOCIETY OF GERMANTOWN, PA.
EDMUND B. GILCHRIST, ARCHITECT

Besides being filled with very good glass, they carry definite and strong associations, not only for the donors, but for the whole congregation, and it is eminently proper that those associations should be treated with all respect and honor. Though of a mode wholly different from that of the structure, they have been incorporated in a manner to which no one could reasonably take exception.

The one thing that detracts from the otherwise perfect consistency of the interior is to be found in the memorial glass set with unvarying monotony in all the clerestory windows. Such windows, at best, are an anomaly in a structure of this sort where clear glass should unquestionably have been used in all the windows, save in some one such isolated and focal feature as the east window, or the windows in the south transept, whose time-honored associations fully warrant their presence. Furthermore, the evanescent, poverty-stricken quality of these uniform memorials,—only a small portion in each is reserved for individual treatment,—suffers terribly by comparison with the distinguished beauty and excellence of the east window. It is only fair to say that the architect was in no wise responsible for this ill-advised aberration, and it is to be deplored that the church authorities either devised or countenanced it. It is idle to say that the objection is based solely on too literal a regard for precedent and tradition; it is justified by fundamental considerations of good taste.

A provision of the plan that will commend itself is the mode of entering the church. In good weather the congregation can mount the steps and go in by the main tower door; in bad weather people can enter more quickly the lower door, deposit their wraps and umbrellas in a cloak room, and then go up inside stairs to the lobby into which the tower door directly opens. Not the least agreeable feature of the group is the arrangement of the parish buildings around the cobble-paved courtyard on the north side of the church. Two items of the composition that are especially arresting are the paneled treatment above the windows of the main parish hall and the adaptation of the so-called Palladian motif above the entrance to the north transept. Throughout this part of the group, as well as elsewhere, there can be discovered a reticent and well studied commingling of details from both French and Italian sources.

The Chapel, the Priestley Library and the Parish Hall
Church of the Unitarian Society of Germantown, Pa.
Edmund B. Gilchrist, Architect

THE WORK OF JOSEF HOFFMANN

BY

SHEPARD VOGELGESANG

THE senses of proportion and of emphasis were unfamiliar. Criticism had been given in the atelier, and as much time as would be given designing a country house or a church had been spent on kindergarten primer illustrations in colored beads. The presence of kindergarten bead work in the same room with architecture, and the interest expended on the problem, illustrate a conception basic with Josef Hoffmann. To him the designing of a chair or a wine glass is a problem as important as the designing of an auditorium. In a sense it is the same problem; the design is to be appreciated in each case in relation to its destined human use, in relation to the material of which it is constructed, in relation to its æsthetic expression,—that is, proportion, rhythm, and color. All this is expressed in his work.

No recent architect has influenced Europe more comprehensively than Hoffmann. He was prominent in the group which in 1898 seceded from the Vienna Academy for the purpose of working, to give each object a logical, harmonious form, exactly adapted to the conditions of present life and expressed by perfect execution. This idea 27 years later was also the inspiration of the French Exposition des Arts Decoratifs,—it is at the heart of the best and the most progressive work in all Europe. The great Viennese architect, Otto Wagner, drawing upon the principles of the "Secession" as it was called, entered into his most creative period in 1900. Till the time of his death ten years ago he pushed the ideas of functional planning and expression of materials ever further toward the present-day goal. A pupil, then assistant with Wagner, Hoffmann carried these conceptions through architecture to the smallest object of daily use. The efforts of Morris and Ruskin to bring art again into contact with life, to revive craftsmanship, found in Vienna sympathy and intelligent interpretation. Hoffmann and Koloman Moser in 1903 founded the "Wiener Werkstatte" with the aim of providing a laboratory for the reanimation of craftsmanship and the understanding of materials which the machine had done much to destroy. The properties of materials can obviously best be learned by hand. After this knowledge is acquired, then can one design for and execute by machine without doing violence to the nature of the material. It is a precept of Hoffmann's that if one learns to do one craft well, one will know something of all crafts. One begins to understand what he means by "We do not dishonor tradition; we respect it." Europe was not slow in recognizing the work of Hoffmann and his associates. Repeatedly

Austrian Building at the Industrial Exhibition in Cologne, 1914

Entrance to the Palais Stoclet, Brussels (1905-11)

honored in his own country, degrees and decorations were early conferred on him by Germany and Italy, the French named him a "Chevalier de Legion d'Honneur" after the 1925 exhibition, and American architects, presently elected him to membership in their Institute.

Garden of the Palais Stoclet, Brussels

With the sanatorium in Purkersdorf, built in 1904-1906, can be placed the Palais Stoclet in Brussels, 1905-11. Both were epochal buildings. At a time when Europe was scaling down the orders to decorate a villa, when architects began with a colonnade or a chateau to make a house for a clerk, Hoffmann conceived the Stoclet from the living requirements of its owners and created beauty out of proportion and his understanding of materials. It was the first of those houses, yearly increasingly numerous in Europe, where the life within builds its masses outward. Preceding the war, from 1911 to 1914, Hoffmann's building became more monumental, and he allowed his decorative sense greater play. There is in this work a continuous sense of quality,—the materials are understood; what is done is performed with largeness. The Austrian building at the Cologne Exposition and the Skywa house are typical of this period.

Primarily a sequestered, luxurious villa, the Skywa house expresses much of the dignified extravagance of pre-war Vienna. The measured rhythms of its mass are an echo of a leisurely, luxurious life. It is not a building destined to make history in architecture, as is the palace of Baron Stoclet. Function is not given the master hand, but it is an original creation, suavely expressing the life of its time. Hoffmann evolved much of the decoration from his earlier influences,—here the archaic Greek is paramount. There is not a motif nor a treatment which can be traced to definite precedent; everything has been transmuted; only the feeling of the originals remains. In the same way that Hoffmann called Klimt from easel painting to mural decorating in the Stoclet house he brought Anton Hanak from the sculptor's studio to the builder's scaffold to decorate the Skywa house. The conceptions of workmanship which began in the "Secession" are continued here.

ENTRANCE FRONT

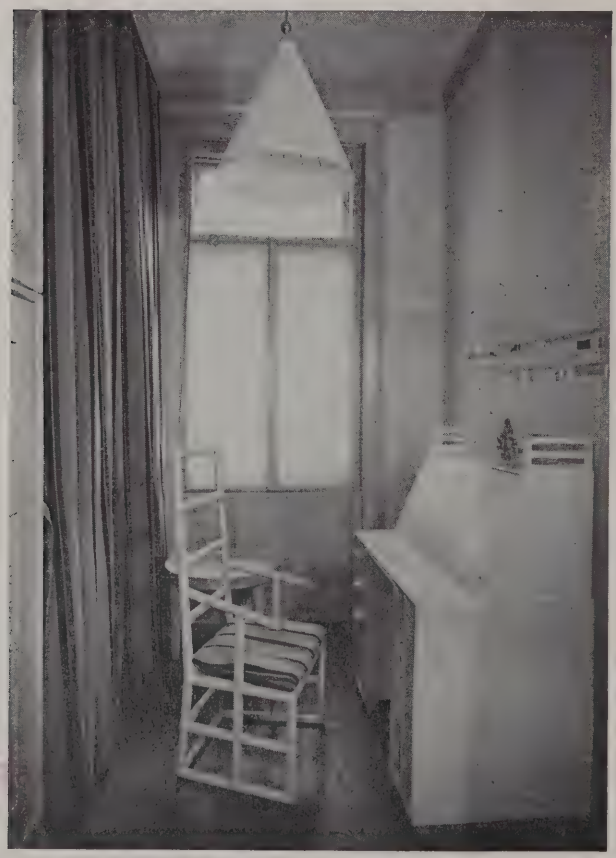
STAIR HALL

BEDROOM

HOUSE OF BAURAT E. AST, ESQ., VIENNA (1925)

JOSEF HOFFMANN, ARCHITECT

LIVING ROOM-BEDROOM FOR A MUNICIPAL TENEMENT SHOWN AT THE EXPOSITION, "VIENNA AND THE VIENNESE"



NURSERY APARTMENT

STOVE AND CHILD'S BED

INTERIORS OF BAUER APARTMENT, VIENNA (1927)

JOSEF HOFFMANN, ARCHITECT

A CLOSET CONCEALS THE BED WHEN NOT IN USE

THE CARPET IS BLACK, STREWN WITH COLORFUL LEAVES AND FLOWERS; THE WALL PAINTING IN PALE YELLOWS AND PASTEL COLORS BY FRAU MARIA LIKARZ-STRAUSS

BEDROOM-LIVING ROOM, IN THE BAUER APARTMENT, VIENNA (1927)

JOSEF HOFFMANN, ARCHITECT

ENTRANCE FRONT

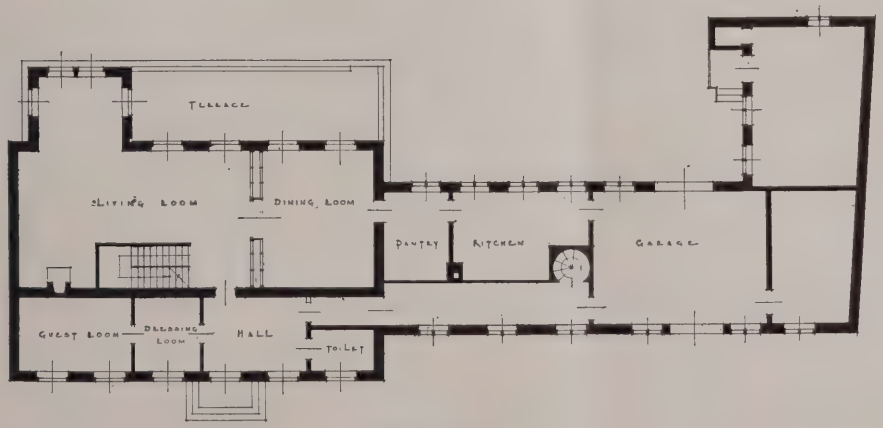
GARDEN TERRACE

VILLA KNIPS, VIENNA, (1925)

JOSEF HOFFMANN, ARCHITECT

GARDEN FRONT

SECOND FLOOR



FIRST FLOOR

VILLA KNIPS, VIENNA (1925)
JOSEF HOFFMANN, ARCHITECT

DETAIL OF THE TERRACE, VILLA KNIPS, VIENNA
JOSEF HOFFMANN, ARCHITECT

STEPS AND TERRACE WALL, VILLA KNIPS, VIENNA
JOSEF HOFFMANN, ARCHITECT

THE WALNUT PANELED BEDROOM

BLACK AND WHITE ENTRANCE HALL

MME. KNIPS' BLUE BOUDOIR

ENTRANCE FRONT AND DRIVEWAY, VILLA SKYWA, VIENNA
JOSEF HOFFMANN, ARCHITECT

BEDROOM IN A COUNTRY HOUSE

STAIR HALL IN MODERN STYLE

Forecourt of Villa Skywa, Vienna (1914)

The value which sound craftmanship can contribute to architecture is readily seen in this house. If there is a somewhat "bravado" permanence in its monumental quality, that assurance of permanence was also part of life in Vienna before the war. Since 1918 the Viennese have experienced the hardest realities of life. Building, where there has been opportunity to build, as well as life, has been forced away from luxury back to the primarily practical. More of Hoffmann's earlier reliance on function is to be found in his post-war work. In the Ast country house built in 1925, there is free expression of the interior arrangement. The house possesses quiet dignity with its informality of plan. The perfection of execution within is carried even into the tea service on the pantry table, the hooks on the wall, and the hardware on the doors. These things, when the finishing of a house is reached, are of importance.

To Americans the Villa Knips (1925-6) seems vaguely familiar. As with the Greek feeling of the Skywa house, so again with the Knips house one feels an influence rather than sees it. The plan is such a personal conception of the owner's needs that there is nothing one knows definitely like it. The guest rooms off the main entrance hall; the master's library accessible from his bedroom on the second floor, because he is a late reader; his wife's suite adjoining, and the attic nursery, are all distinctly an outgrowth of one family's mode of living, which would not suit other individuals. The living room and dining room are separated by a glass partition, thus giving to a small house the maximum sense of

Garden Front, Villa Skywa, Vienna

interior space. The "T" shape of the living room provides relief from the boxed-in feeling given by four walls. There is place for one's various moods all in the same room;—the sunny window end overlooking the garden, the retirement of the fireplace at the other extremity of the "T" branch, and the more formal portion represented by the stem of the "T" where one can receive acquaintances without entirely admitting them to the intimacies of hearth and garden. It is odd to find a feature in this house very typical of an arrangement much used in our most northern older states but seldom repeated in present-day design,—namely, the inclusion of the garage in the service portion of the house joined to the main part of the house by a corridor. Just such an arrangement was customary in New Hampshire and Vermont less than a century ago, where stables almost invariably connected indoors with the house. So little used is this feature at present that the probability that Hoffmann reached this solution entirely independently is almost a certainty.

The apartment which Hoffmann executed for Bauer is a product of the post-war economic condition of Vienna. The state is doing much to give the laboring class inexpensive housing; other classes make difficult shift for themselves. Room was limited; it was desirable to maintain a sense of quality throughout. The number of objects was kept to the essential, and the materials used were of the best,—nut wood for the furniture, and the walls and curtains are fine hand work. The use of folding beds, which economize space, is frank, and provision is made for

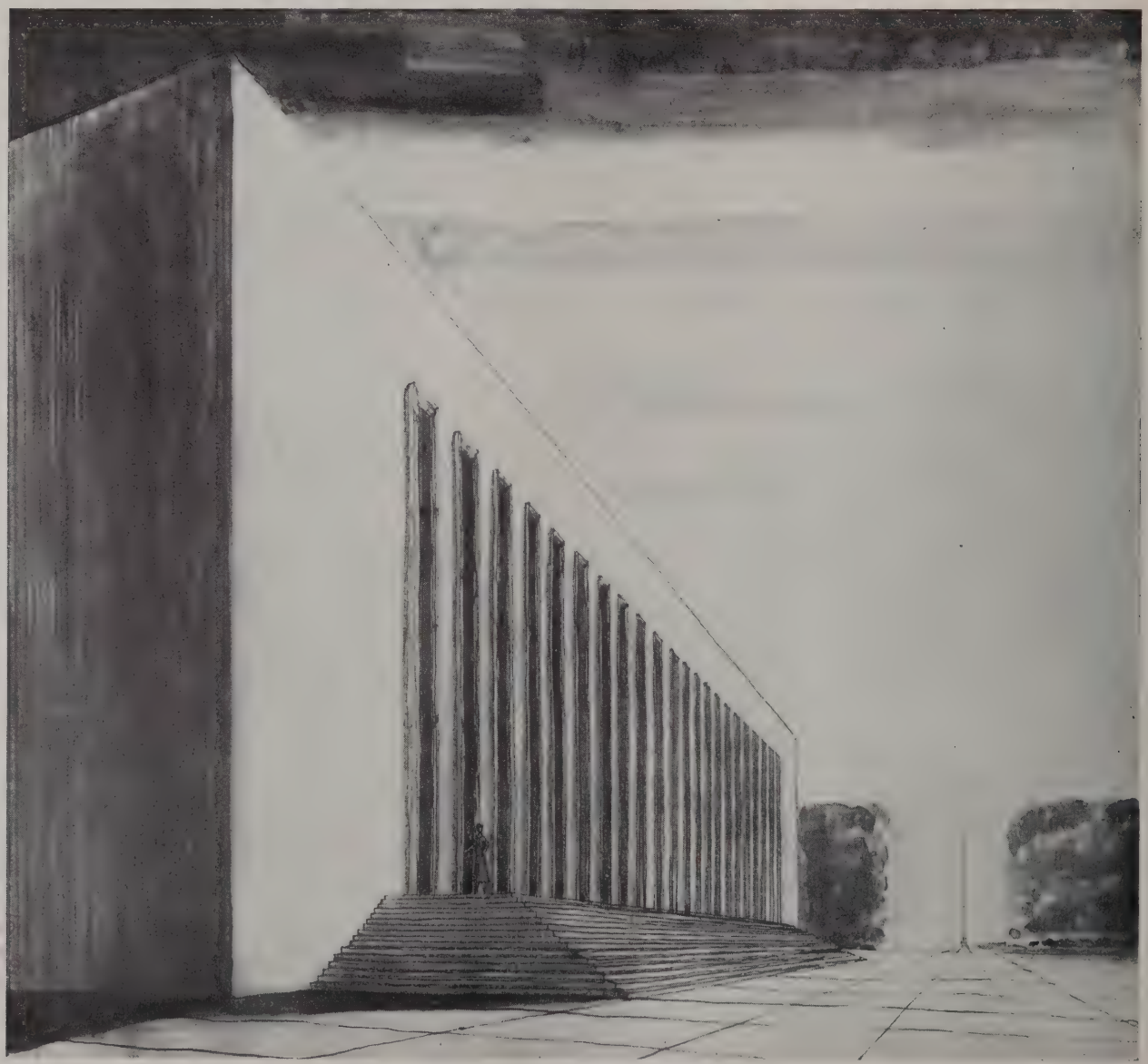
TENNIS BUILDING, GARDENS OF THE VILLA SKYWA, VIENNA

GARDEN HOUSE AND TERRACE, VILLA SKYWA, VIENNA

TERRACE AND TOWER, PALAIS STOCLET, BRUSSELS (1905)
VENEERED IN WHITE SWEDISH MARBLE, BOUND AT THE CORNERS WITH BRONZE
JOSEF HOFFMANN, ARCHITECT

ventilating them, when closed. A pull of the curtain does much to bring the needed change in a room where one both sleeps and lives. The baseboards and ceiling moulds are designed to facilitate cleaning, and the rounded character of the nursery furniture offers a buffer to the wear and tear of a rough-house and softens the bumps for the child. Too much emphasis may have been given the physical, human needs;—there are besides psychological considerations. Designing the paper for the wall of a bedroom is a problem different from the decoration of a dining room or a hall. In a Catholic church one can afford to suppress the structural emphasis. The cross and statues of the saints are there, and the question of their support in the structure is of small interest to the beholder; all is less a matter of logic than of faith. If one designs for children, it should be remembered that repetition is just that to a child. A design for a child's dress material repeating a bunny and a carrot, is just so many spots, and might as well be polka dots for him. Older people can concentrate on the maze, pick out the bunny and the carrot, and conceive of the phenomenon of a child completely covered with bunnies and carrots.

A plan of the auditorium, a recent competition design, is unfortunately not available. The perspective, however, gives a sense of what Hoffmann means by simplicity, by the sufficiency of doing one thing once. Here the one thing is rhythm, the sort of design which was architecture before a building was tied in a knot about a cartouche. Hoffmann's æsthetic teaching is almost summed up in the ideas of proportion and rhythm. Artistic expression is to be found within these limits, and it is guided toward simplicity and clarity. America is beginning to feel the influence of the modern spirit. There is a great deal of talk about the "modernism" of the world. The best that can be done, if one is given the chance, is to be keenly and clearly contemporary,—but it requires real genius if the result is to be successful.



Perspective Sketch for Concert Auditorium (1927)
Josef Hoffmann, Architect

INTERIOR ARCHITECTURE

EXHIBITION MODERNISM VERSUS HOME MODERNISM

BY
LUCIAN BERNHARD

MOST people know the so-called "modernistic" interior only from exhibitions or perhaps from the *mis en scene* of a night club. Whenever one happens to listen to the comments of visitors at such an exhibition, one hears: "Quite interesting, but I could not live in such a room."

In countries where the modern style has already been adopted and developed in many private houses, one will always find a great difference between the appearance of a home where people actually live and an exhibition room designed by the same artist. The necessity for this difference is quite obvious. An exhibition of interiors to be interesting must be radical and dramatic. It has to emphasize the departure from tradition rather than the relationship to past precedent. It must be stunning; it has to show up a new idea in full strength and without compromise. As no one lives there, no consideration in regard to restfulness is necessary, and none to comfort, subdued colors, wear and tear and practicability of the furniture. It is a demonstration of an idea and nothing else. Not even the designer himself, according to my experience, would care to live in such rooms. These characteristics hold true not only for exhibitions but for the decoration of night clubs, foyers of theaters, interiors of steamers, hotels, show rooms and beauty parlors. Here people do not actually live. They need endure these surroundings for only a short period of time. People who frequent night clubs want to be exhilarated. They are seeking stimulation and exciting atmosphere. Nothing can serve them better than the many possibilities offered by the abandonment and extreme of some modern creations. All the wild exaggerations and brain storms of the turned-loose copyists contribute fantastically to the punch one is hoping to find in such places. We do not need to look at this too critically. It serves its purpose. The homes

Photos. Tebbs & Knell, Inc.

Living Rooms, Apartment at 791 Park Avenue, New York
Lucian Bernhard, Designer

AN ALCOVE WITH BUILT-IN BED

STAIRWAY IN CORNER OF ENTRANCE HALL

APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK

LUCIAN BERNHARD, DESIGNER

ENTRANCE TO THE LIBRARY

END OF LARGE LIVING ROOM

APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK

LUCIAN BERNHARD, DESIGNER

THE DINING ROOM HAS DEEP IVORY PAINTED WOODWORK, BLACK FRIEZE, GOLD CORNICE AND CEILING

EXTRA CHAIRS WHEN NOT IN USE FORM DECORATIVE BASE TO BUILT-IN SIDEBOARD

APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK

LUCIAN BERNHARD, DESIGNER

OLD GOLD, BLUE AND DEEP ROSE ARE SOME OF THE COLORS USED FOR THE CURTAINS AND UPHOLSTERY

BUILT-IN SEATS HAVE DRAWERS AT EACH END FOR PLAYING CARDS AND SCORE PADS

APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK

LUCIAN BERNHARD, DESIGNER

SPACE IS SAVED BY BUILDING IN THE BEDS AND BOOKCASES
APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK
LUCIAN BERNHARD, DESIGNER

SIMPLICITY IN DETAIL AND BEAUTY OF COLOR CHARACTERIZE EVERY ROOM
APARTMENT IN MODERN STYLE, 791 PARK AVENUE, NEW YORK
LUCIAN BERNHARD, DESIGNER

where people live with their families, in contrast with exhibition, night clubs or show rooms, must be looked at from quite a different angle. A good interior cannot be the self expression of the artist; it must be a compromise between the self expression of the artist and the self expression of the owner. First, it is designed to please for a comparatively long time; second, it has to suit not only the gay hours but the sad moments; third; it has to be restful, intimate and comfortable; fourth, it has to please not only one member of the family, but all of them with their usual very different views of life. It must be remembered that comfort here is more important than style, and practicability more than effect. A less smart looking member of the family must not look ridiculous and be made to feel uncomfortable and out of place, as he certainly would in an ultra-modern exhibition setting. The rooms should not be exciting. We do not want them to cry out: "Look, how modern and clever we are." We want them to form an unobtrusive background for the average modern personality. Our present-day life is exciting enough. We want homes to have a quiet and restful atmosphere in which to relax.

While we do not want to live in masquerades of the past periods, while we do not want to imitate a Tudor library in a modern skyscraper apartment, while we do not want to use imitation candlesticks for our electric light fixtures, or sentimental bell ropes instead of push buttons any more than we want to imitate old carriages for our automobile bodies, and while we do not want to copy in our machine-made furniture non-essential lines, ornaments and peculiarities of past periods, such as early Renaissance chests with imitation worm holes to house our latest model radio, on the other hand we do not want to deny the perfection of a genuine old masterpiece or the æsthetic value of a beautiful room of the past based on human proportions which never change. The more we become sure of ourselves the more we will be unafraid and unashamed to acknowledge the great heritage bequeathed us by the masters of the past. We should be able to merge their best with our own and adapt it to our modern needs, mediums and methods without copying them thoughtlessly and slavishly. The more we feel sure of ourselves the more we will keep friends with tradition and extend hospitality to such fine old pieces as we may have inherited or collected or enjoyed. We want to be proud of our day and its achievements, but nevertheless we want to acknowledge all the wisdom and art of older generations as far as it still holds good for us and logically influences the art and architecture of our civilization. With all our achievements of modern form and color creations, the world would be very poor and empty if the work of the architects, painters and sculptors of the past should be blotted out forever.

Many of the European creative designers who started the revolution about 1900 have already outlived their radicalism for the sake of evolution. They are not afraid to incorporate with the essentials of the modern idea all the inspiration they can derive from admiring and understanding, not imitating, the masters of the past. The houses, steamers, clubs and shops designed by these artists may not yet be appreciated by the masses, but they are thoroughly liveable, well bred, a product of our times.

Reminiscent of the French Style is the Alcove Arrangement of the Beds in the Principal Bedrooms
Apartment in the Modern Style, 791 Park Avenue, New York
Lucian Bernhard, Designer

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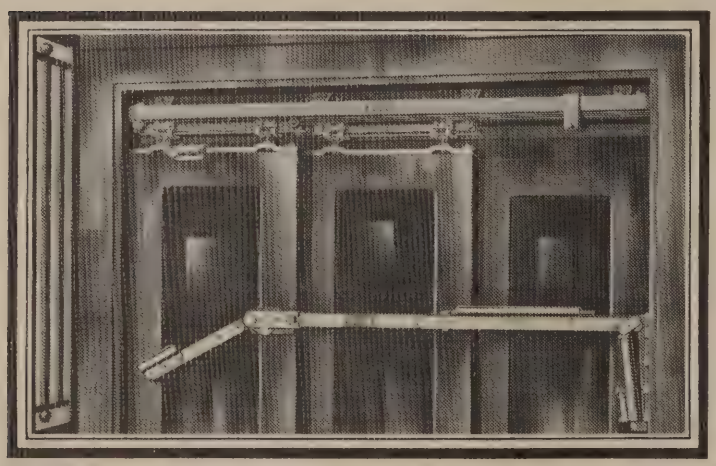

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BOOK DEPARTMENT

"STEVENS MASTER SPECIFICATIONS"

Reviewed by CLIFFORD WAYNE SPENCER

THE writing of specifications is a very important part of the business of planning and erecting buildings, and it is so important that nothing be omitted that it is almost impossible to prepare a really complete set of specifications without having some sort of well organized guide on which to proceed. In many cases this is the product of the specification writer himself and is based on long years of experience. There are, however, guides or master specifications compiled by authorities on the subject which combine the best practices in this field of activity and are published in such form that they can be readily adapted to any particular piece of work by substituting for others certain clauses which apply to the work in hand,—to its type as well as to its extent.

Foremost among such publications is the work known as the "Stevens Master Specifications for Architects and Builders." The 1928 edition of this is now ready and is a most complete guide for the writing of specifications. In the preparation of this work Mr. Stevens has consulted architects and engineers of the entire country. Many of these offered valuable suggestions and rendered great assistance in checking over the work compiled by Mr. Stevens. The specifications are handsomely bound in a loose-leaf imitation leather binder, indexed with thumb tabs for ready reference, and numbered so that the specification writer will be able to simply jot down the numbers of the paragraphs and clauses he wishes to incorporate in the completed specification so that the typist can copy the material directly from the master specification. As is the custom, the material is subdivided into groups covering each class of work. Each of these subdivisions is indexed separately, and all possible contingencies are provided for. The first section contains instructions to bidders, and covers such matters as description of the documents and how they may be obtained, requirement of a certified check as a guaranty of the good faith of the bidder, and the filing of a bond by the successful bidder. It describes how the proposals shall be made and specifies the form to be used. A form is also included for the submission of unit prices to govern in cases of additions or deductions from the contract price made necessary by changes or additions to the original plans and specifications. This list is very complete and includes all kinds of material and labor. The second section contains a specimen copy of the fourth edition, 1925, of "The General Conditions of the Contract for the Construction of Buildings," standard form of the American Institute of Architects. This section

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also contains a copy of the A. I. A. Document No. 172, which is "The Standard Construction Classification for Filing Adopted by the American Institute of Architects." Section Three contains supplementary general conditions applying to the particular project for which the specification is being written. The fourth section covers wrecking of the buildings which may be on the site where the new building is to be located. The specification for foundations contained in Section Five covers the four important types of foundations, namely; caisson foundations, concrete pile foundations, composite pile foundations and wood pile foundations. The masonry specification, which occupies the sixth section, does not include concrete, brickwork or hollow tile. These items are usually included in the masonry contract and covered in separate sections of this master specification and may be copied into the general masonry specification in places indicated by the author. The section on stone (Section Nine) covers use of three kinds of stone, granite, exterior marble, and limestone, and a separate section (Section Ten) is devoted to cast stone work. Other branches of the work which are covered in separate sections are terra cotta, waterproofing, structural steel, roofing, sheet metal, miscellaneous iron and wire mesh, ornamental metal, fire doors, steel and metal windows, elevator enclosures, hollow metal doors, carpentry, plastering, glass and glazing, marble and slate, art marble, finish tile, terrazzo, rubber tile, cork flooring, mastic composition, painting and decorating, weather strips, screens, acoustics, insulation, specialties, and store fronts, making 40 sections in all.

The specification is made especially valuable by the insertion of bits of information at the proper places and by the inclusion of advertising leaflets of some of the more prominent manufacturers of building materials. These are placed immediately after the sections in which their particular class of material has been specified and contain much information that will be of use to the specification writer. At the end of the volume are lists of these advertisers, classified both alphabetically and as to kind of material, a detail of considerable value.

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PICTURESQUE ARCHITECTURE IN PARIS, GHENT, ANTWERP, ROUEN, ETC. Drawn from Nature on Stone by Thomas Shotter Boys, 1839. 115 pp., 9½ x 12 ins. Price $8 Net. The Architectural Press, Westminster, London, S. W.

LITHOGRAPHY, the youngest of the family of graphic arts, has long been the family's stepchild. Ever since the discovery of the process by Senefelder, 150 years ago, the easy possibilities it offers for commercial purposes have flooded the markets with cheap color prints, unworthy reproductions of beautiful originals. Thus this particular medium has been brought into such wide disrepute that an unfavorable popular connotation has become attached to the mere word, "chromo,"—a connotation which it by no means deserves. Indeed the art was so generally misused in the past century that it has come to be regarded with mistrust by both patron and artist. Yet it is an art capable of great beauties,—one that might well hold its head high and proudly among the other members of its family.

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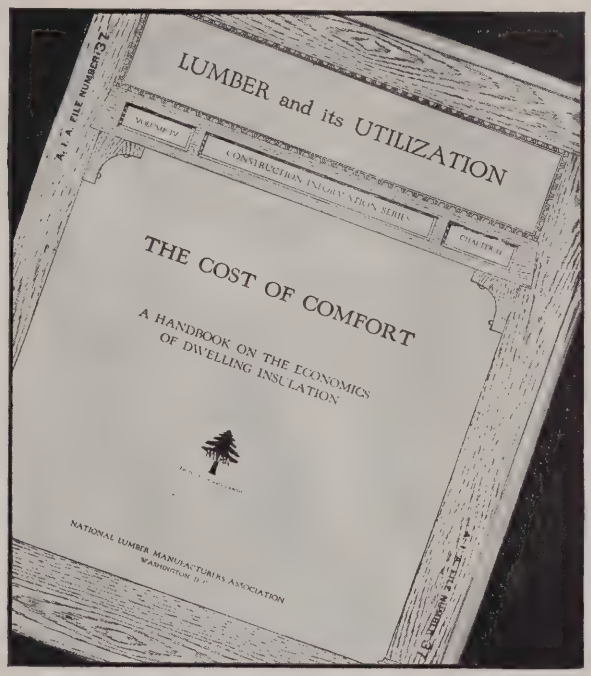

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its erstwhile downfall, welcome the appearance in book form of a collection of 26 color prints which prove that the art is once again coming into its own. We refer to a re-issue of the "rare and beautiful delineations of continental cities" made in the nineteenth century by that master lithographer, Thomas Shotter Boys. Mr. Boys made these drawings on stone, from nature, in the first half of the nineteenth century. The collection was published in his life time (1839) with a dedication to the original printer whose skill advanced the art employed, for, after all, the success of lithography depends largely on the printer's taste and ability. The present volume is a re-issue of those drawings in color prints by a process quite new to the public and one which shows a still further advance of the art. It is accompanied by descriptive notes of each plate and an introduction by E. Beresford Chancellor. The book is the sequel to Mr. Boys' "Original Views of London," these being the only two works which that artist ever issued. The "London Views" were re-issued in 1926, and the immediate popularity which they met inspired this re-issue of the "Continental Views," probably likewise destined to favor.

Other great artists have from time to time experimented with lithography. Whistler made its acquaintance in the late seventies, perceiving that herein lay a new field for expression, a field in no wise inferior to those of dry point and etching, in which he was already proficient. Since his day Nicholson, Ricketts, Shannon, Brangwyn and others have done much to elevate the art of lithography to the prestige of its early days. Germans and Austrians have employed artists of established merit to produce color prints, the beauty of which has been recognized the world over, in spite of the fact that they are available for comparatively small sums. Railroads in this country and Europe have seized upon the process to produce color posters of their scenic routes which even the most critical are often forced to admire. All of these owe an obvious debt to the prints of Thomas Shotter Boys. He was the first to invest the art with a humanizing quality by introducing men and women into the scenes, depicting customs and modes of life as well as landscapes. Now in the present issue of his "Picturesque Architecture in Paris, Antwerp, Ghent, Rouen, etc.," the technical process has been carried so far beyond that originally required for polychrome architecture as to make of lithography almost a new art. So fine is the result achieved that the specimens put forth have been mistaken for water color drawing or prints wrought by the hand of the colorer in imitation of the originals. But, as Mr. Chancellor sets forth in his introduction, the drawings are produced in their entirety by means of lithography. "It was expressly stipulated by the publisher," he says, "that not a touch should be added afterward, and this injunction has been strictly obeyed. These are pictures drawn on stone and reproduced by printing with colors. Every touch is the work of the artist; every impression the product of the press." The pictures are printed in oil on paper by a new process. The result is a purity and brilliance of tone in which solidity is combined with transparency. The difference from the usual effect Mr. Chancellor explains: "In mere decorative subjects, the colors are positive and opaque, the tints flat,

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HUDSON RIVER BRIDGE UNDER CONSTRUCTION

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The Architectural Forum

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER FIVE

NOVEMBER 1928

THE DEVELOPMENT OF THE SUSPENSION BRIDGE

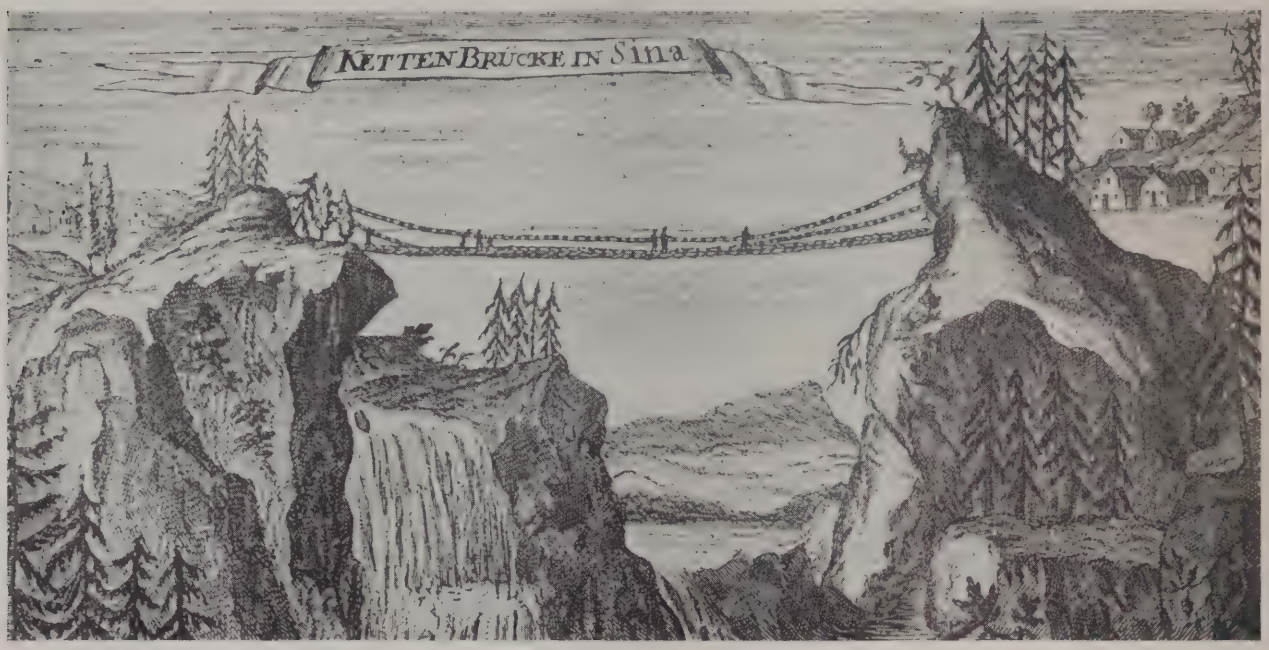
BY
CHARLES A. JOHNSON

THERE is something about a bridge that is inspiring and stirs the imagination. This is especially true of suspension bridges, with their light and graceful cables sweeping across spaces from one tower to another and supporting with their slender vertical cables avenues of progress. It is not known what inspired the first suspension bridge. It may have been a vine trailing from one tree to another that primitive man used to cross a ravine to save himself the labor of scrambling down and up the steep sides to get from one side to the other.

The first suspension bridge of which we have record was built in A.D. 65 in China, in the province of Yunnan, by order of Emperor Ming. It is described as being 330 feet long, with planks resting on the chains. All of the early suspension bridges were of this form, with the floors of the bridges following the catenary curves of the cables. Bridges of this type are found in China, India and other far-off parts of the world. The modern type of suspension bridge is an American invention, and its greatest development has been in this country. The suspension bridge is the oldest and most picturesque type of metal bridge. It is light and graceful; provides a roadway at low elevation with unobstructed view; has low center of wind pressure; dispenses with the use of falsework during construction; uses materials that are easily transported and erected and eliminate the danger of failure during erection. After completion, a suspension bridge is the safest structure known to bridge engineers.

James Finley, of Fayette County, Penn., built a suspension bridge of 70-foot span across Jacob Creek on the turnpike from Uniontown to Greensburg in 1796. The bridge was suspended from two iron chains, one on each side, the lengths of the links being governed by the distances between the suspended floor joists. The chains had a sag of 10 feet, or one-seventh of the span, were supported by masonry towers having the same angle of inclination on each side, and were anchored by large stones on shore. The suspended wood floor was 12½ feet wide without any stiffening truss, and the cost of the bridge was about $600. Finley obtained the first patent on this bridge from the United States government. Modern bridge engineers say that Finley's bridges were remarkably well designed structures for that time, and that he used sound principles of construction. The principal features of his invention consisted in the use of stone abutments, in the introduction of only two chains, one at each side of the bridge, and rigid floor construction. His chains were forged wrought iron links. Up to the year 1801, eight bridges had been built in the United States according to Finley's patent, and between 1801 and 1809 many others were built. The largest of these, the bridge across the Schuylkill at Philadelphia, was 306 feet long and was erected in 1809. This bridge had an intermediate pier with two spans of 153 feet each, and was the first suspension bridge with more than one span. The cables were made of long, iron links from which the floor was suspended by rods. It collapsed in 1811 under an excessive load of cattle, and was replaced by another suspension bridge which fell in January, 1816, under a load of ice and snow. The third bridge on this site was opened in June of the same year and had a single span of 408 feet with a foot-walk only 18 inches wide. This bridge was erected by White & Hazard, who owned and operated a wire mill in the vicinity, and the cables were composed of six ⅜-inch wires. The wood floor was without stiffening and would support only eight persons at a time. The cost was $125, and a toll of one cent was charged for each person. The outstanding feature of this structure was that it was the first wire suspension bridge ever erected in any country. It fell soon after its erection, under a load of snow and ice, and was replaced by a wooden bridge.

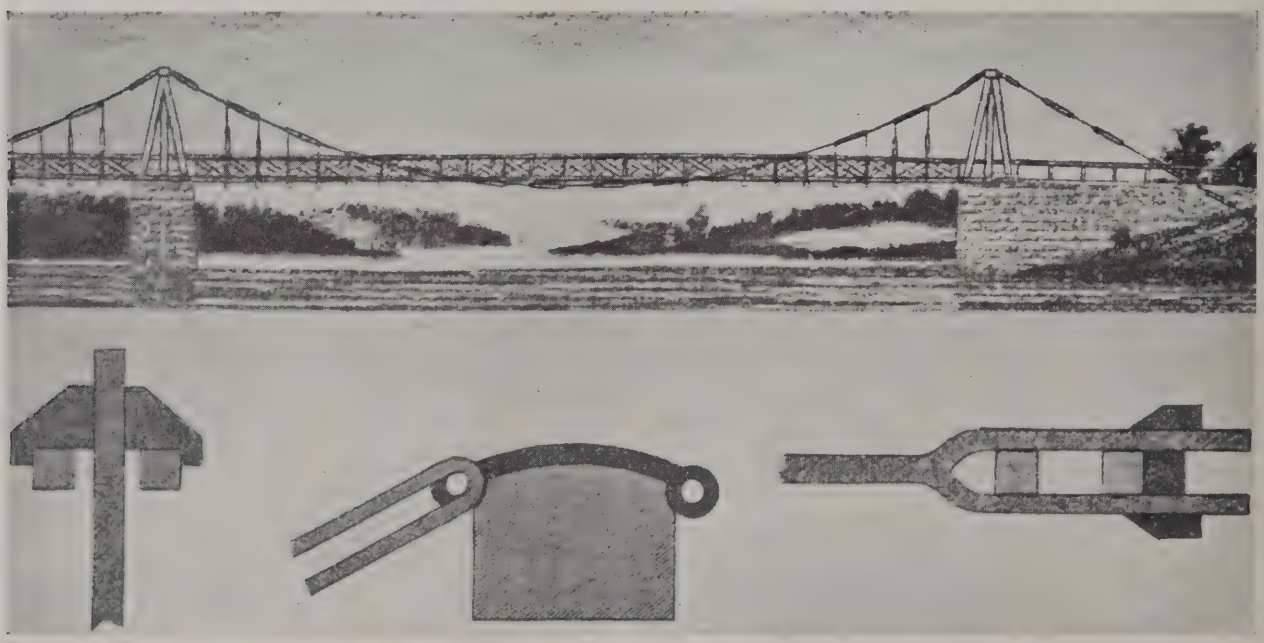
The most famous of the old chain bridges designed after Finley's patent was that across the Merrimac River, three miles from Newburyport, Mass., which was built in 1810. This bridge was built by John Templeman, of Washington. It had a span of 244 feet, a clearance of 40 feet above the water, and cost $25,000. The two roadways, each 15 feet wide, "were strong enough to allow for the passage of horses and carriages, whatever their speed. The railing was stout and strong, which contributed much to the stiffness of the floor." Each



Suspension Bridge, Built A.D. 65 in the Province of Yunnan, China

roadway was supported by two sets of cables, each containing three chains, or a total of 12 chains for both roadways. The links were 27 inches long, made from 1-inch square bars, and the floor supports were 7 feet apart. The chains were forged on the spot, and when it was rebuilt in 1909 they had not been painted for 70 years and were in good condition. When the iron was analyzed it was free from slag, which proves that the purer the metal the better it will resist corrosion. The towers supporting the cables were built of masonry up to the under side of the bridge, and the superstructure of the towers was constructed of timber framing, sheathed and shingled on the outside. The towers were 37 feet high above the floor. In 1869 the woodwork was entirely rebuilt. The anchorages were 100 feet back of the towers. Modern traffic was responsible for the passing of this bridge after a century of service. So strongly had it made its impression on the people that the law providing for its rebuilding specified that it should be rebuilt along the same lines as the old bridge.

In 1811, Sir Samuel Brown, of England, first proposed the use of flat bands or links instead of the square and round bars previously used. In 1818, wrought iron bars were introduced. Wire cables were introduced in the early part of the nineteenth century and found special favor in the building of the larger suspension bridges, particularly in France and in America, but eye-bar construction has lasted.

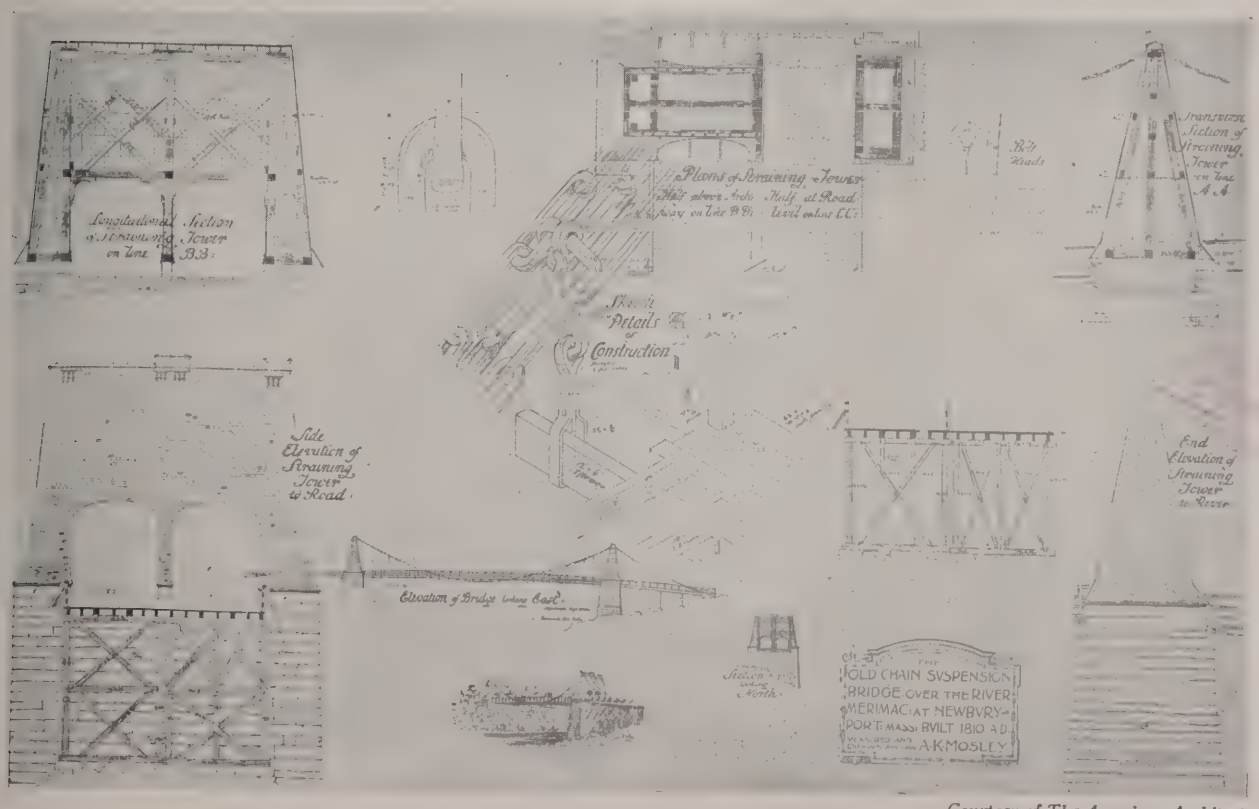


Early Bridge Across Schuylkill, Philadelphia, Built 1809. First Suspension Bridge with More Than one Span

Menai Strait Bridge, Wales, Built 1826; the First Large Suspension Bridge

Suspension bridges usually have either a single span or three spans. The single span has the floor of the central span between the towers supported by the cables, has straight back stays, without suspenders, and the floor of the end spans is supported by steel trusses or columns under the floor. The Williamsburg Bridge is an example of this type. In the three-span suspension bridge the floors of the central and of the end spans are supported by the cables, which makes a much more graceful and symmetrical structure than where the end spans are supported by piers below the floor of the bridge.

The first very large suspension bridge was built in 1826, by Thomas Telford, across the Menai Strait, between the Island of Anglesey and Carnarvonshire, Wales. The central span of this bridge was 580 feet, with side spans of 280 feet, which were supported by four 50-foot stone arches at one end and three similar arches at the other end, making a total length, including the approaches, of 1710 feet. The width of the bridge was 30 feet, having two 12-foot driveways with a 4-foot walk between. The floor was supported by 16 main cables arranged in four sets vertically above one another, one set at each



Courtesy of The American Architect

Details of Chain Suspension Bridge Built in 1810 Near Newburyport, Mass.

Williamsburg Bridge, New York. Central Span Only Supported by Cables

side of each roadway. The masonry towers were 152 feet high and were 29 feet thick at the level of the roadway. Each chain contained five iron bars, 3¼ inches by 1 inch, 10 feet long, united by 8-inch by 16-inch links and 3-inch pins. This bridge was erected over a century ago and is still in use.

Von Mites in 1828 constructed a chain bridge over the Danube Canal, having a span of 334 feet. The cables were flat bars of open hearth steel, and this was the first use of steel for bridge building in any country. In 1860 this bridge was taken down and replaced with a suspension bridge, designed by Schnirch, having a span of 255 feet, and was notable for being the first and only railroad suspension bridge in Europe. In building the early suspension bridges the wires were formed into strands on the ground, and the strands were then raised up to the tops of the towers. M. Vicat, in 1831, first wove the cable in place during the erection of a bridge over the Rhone. At Fribourg, Switzerland, a bridge was erected over the Saone Valley by M. Chaley in 1834. It had a span of 870 feet and a width of 21 feet, consisting of a roadway 15 feet wide and two 3-foot sidewalks. The floor was supported by four iron wire cables, two on each side of the roadway. In 1880 it was reinforced by adding one more cable on each side. This bridge was recently replaced by a massive viaduct, after nearly a century of use.

John A. Roebling greatly improved the design of wire cable suspension bridges. One of his earliest works of this type was the construction, in 1844, of the Pittsburgh Aqueduct across the Allegheny River. This bridge consisted of seven individual spans, each 162 feet in length, and was supported by two 7-inch wire cables. In 1854 Mr. Roebling accomplished the then thought impossible feat of constructing a combination railroad and highway suspension bridge across the Niagara Falls Rapids. This bridge had a span of 821 feet and was the first long suspension bridge to be constructed with stiffening trusses, assuring a rigid floor. Stiffening trusses had been used a few years before on a small suspension bridge over the Kentucky River at Frankfort, Ky., but the span was only of 200 feet. In 1867 a bridge was built across the Niagara River a short distance below the falls, by Samuel Keefer of Ottawa. It had a span of 1260 feet, and the clear width of the roadway was only 10 feet, which did not permit carriages to pass, and in 1888 it was widened to 17 feet. The cables were of iron wire, which was imported from England, and were supported on wooden towers.

For years John A. Roebling had been studying the possibilities of spanning the East River with a bridge. His production of drawn steel wire made the erection of the Brooklyn Bridge a possibility. All previous suspension bridges' cables were fabricated from wire drawn from charcoal iron, the Brooklyn Bridge being the first in which steel wire was used. The protection of the wire in the cables had been oil, grease or paint. In the Brooklyn Bridge galvanized wire was used, thus introducing zinc for the first time as a protective coating for bridge wire. The Brooklyn Bridge was completed under the direction of Col. Washington Roebling in 1883, and at the time was one of the wonders of the world, far outranking in size any similar structure. Its simplicity, ruggedness and beauty of line have made it a bridge that it is difficult to surpass. The central span is 1595 feet, 6 inches long, with end spans of 930 feet. The total length, including the approaches, is 5989 feet. The width of the bridge is 86 feet and has accommodations for two elevated railroad tracks, two trolley tracks on the 17-foot roadways, and a raised center walk, 15 feet wide. The

Aërial View of Delaware River Bridge, Completed 1928

bridge is supported by four cables, each 15¾ inches in diameter, which are carried on stone towers 278 feet above water. The clearance is 135 feet, as required by the War Department.

The longest suspension span now existing is that of the Camden-Philadelphia Bridge over the Delaware River, completed in 1928. This bridge has a central span of 1750 feet and end spans of 716 feet, 8 inches. The total length, including the approaches, is 8240 feet. The width of the bridge is 128 feet, 6 inches, and it has a 57-foot roadway for six lanes of traffic, four tracks for rapid transit, and two elevated footwalks each 10 feet wide. The bridge is supported by two wire cables each 30 inches in diameter, which are carried on steel towers 380 feet above the water. The clearance under the bridge is 135 feet. This bridge was designed and constructed under the direction of Ralph Modjeski, chief engineer, and Paul Cret, architect.

During the last 25 years no new types of suspension bridges have been introduced, but considerable advance has been made in design. The quality of material has been improved, and its strength has been greatly increased. The testing laboratories which now exist have given engineers more complete knowledge of the materials with which they are working The perfection of the pneumatic caisson has made it possible to build foundations for structures in locations that were considered impossible.

The Port of New York Authority is now building a suspension bridge to cross the Hudson River from Fort Washington Park at 178th Street, New York, to Fort Lee, N. J. This bridge has a span of 3500 feet, which is twice the length of span of the longest existing suspension bridge. The bridge is being designed and constructed under the direction of O. H. Ammann, Chief Engineer of Bridges of the Port of New York Authority, and Cass Gilbert, architect. Some laymen have questioned the feasibility of constructing such a long bridge. Mr. Ammann, in his first progress report on the Hudson River Bridge, says that "engineers familiar with the design and construction of large bridges have pointed out from time to time that the feasibility of building a bridge of as long a span as 3500 feet and more is esentially a question of economy, and that the span length and size of bridge have nothing whatsoever to do with its safety, either during erection or after completion. The feasible limit of span is reached when the amount of metal required to carry a given load becomes excessive in cost, and not because the safety is impaired. The physical limit of span is reached when no amount of metal can safely carry more than its own weight. The latter limit can be mathematically determined for the safe strength of any given material, and has been calculated by various authorities at 10,000 feet and more."

The location of the Hudson River Bridge is well suited to a suspension bridge on account of the high land on both sides of the river at this point, which makes it possible to construct a bridge with comparatively short approaches. The side spans of this bridge are 650 feet long, and the total length including the approaches is 7800 feet.

The width of the bridge floor is 118 feet, and there will be a central roadway 40 feet wide for four lanes of traffic, two side roadways each 24 feet wide accommodating two lanes of traffic, two footwalks each 11 feet, 6 inches wide, and a lower level for either four or six lanes of rapid transit as conditions require. The bridge floor will be supported by four wire cables, each 36 inches in diameter.

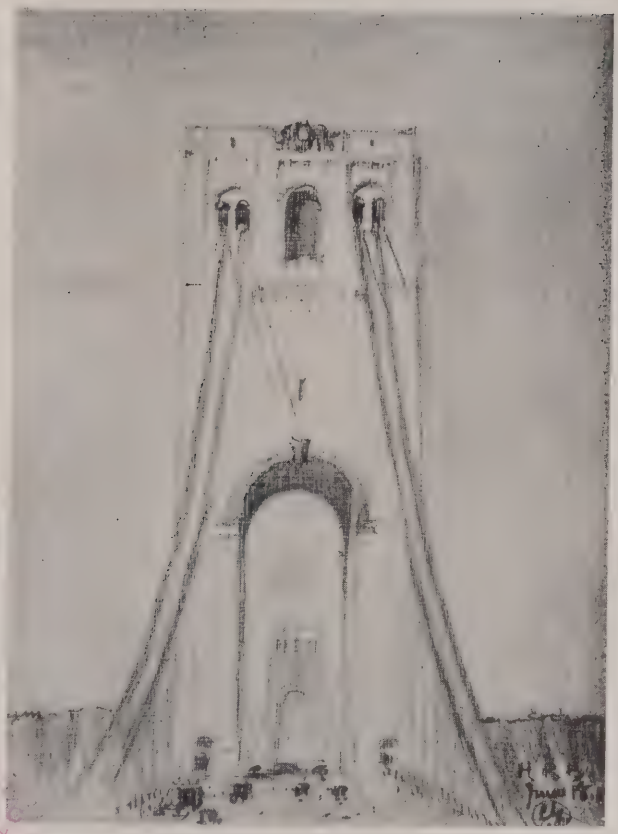
GENERAL VIEW OF HUDSON RIVER BRIDGE

VIEW OF HUDSON RIVER BRIDGE SHOWING NEW YORK ANCHORAGE AND APPROACH

CASS GILBERT, ARCHITECT

O. H. AMMANN, CHIEF ENGINEER OF BRIDGES, PORT OF NEW YORK AUTHORITY, ENGINEER

Preliminary Perspective of New York Approach, Hudson River Bridge

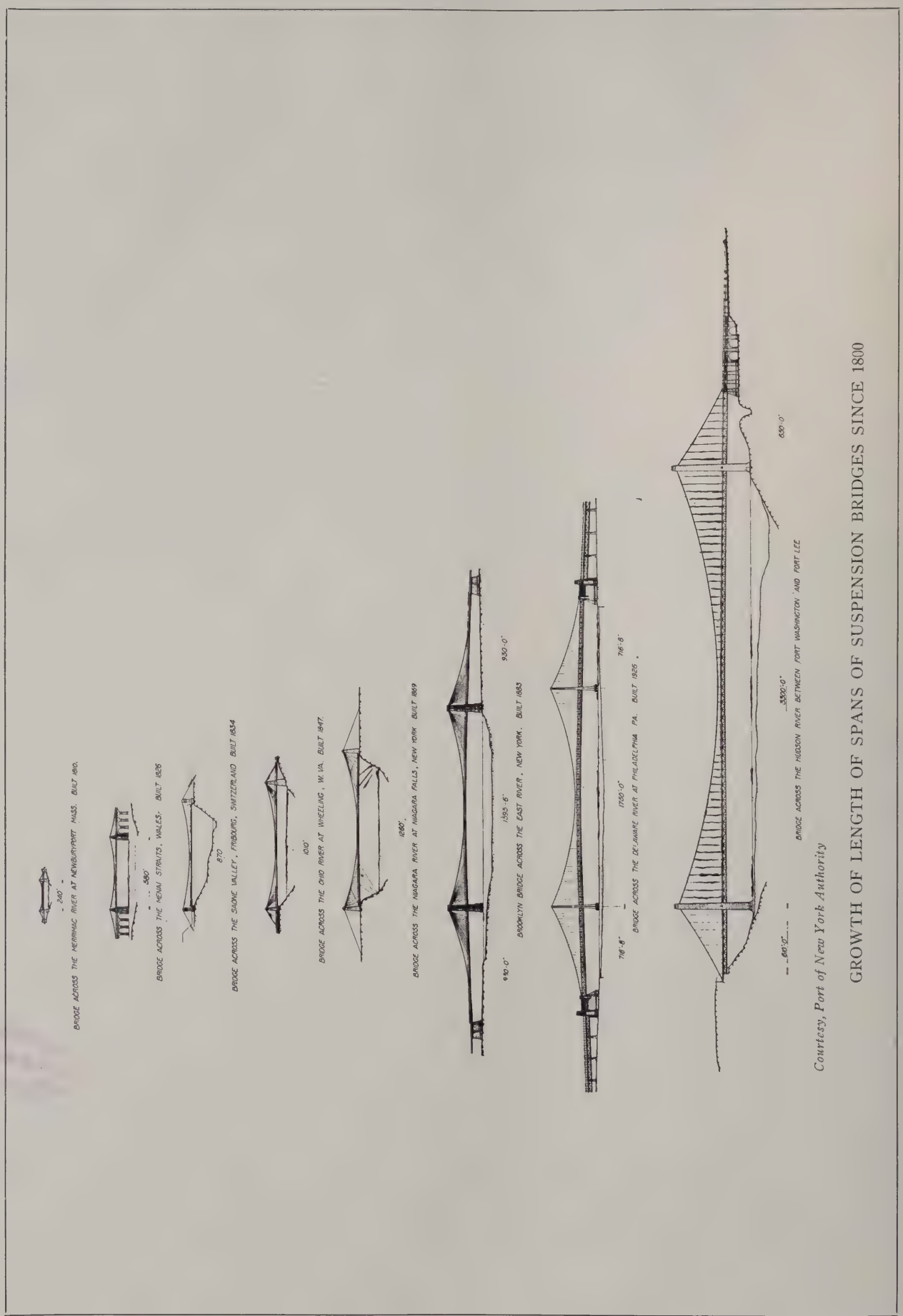


Preliminary Study of Tower Design. Original Sketch by Cass Gilbert, Architect

Each cable will be composed of 26,474 wires or a total of 105,896 wires. The cables will be supported on steel and masonry towers, 210 feet by 65 feet at the base, and 635 feet above the water. Comparing the towers with the Washington Monument, which is 55 feet square at the base and 550 feet high, some idea may be gained of the stupendous size of this structure. The roadway of the bridge is 253 feet above the water at the center of the bridge, and it passes through the towers beneath a great arch 95 feet wide and about 230 feet high. The clearance under the bridge is 213 feet at the center of the bridge, and 195 feet at the towers. The New York anchorage is an almost solid mass of concrete and masonry, 290 feet by 200 feet at the base and 130 feet high, in Fort Washington Park. The New Jersey anchorage consists of steel beams and eye-bars which are buried 240 feet in the solid rock of the Palisades.

The New York approach connects with Broadway, and it crosses Riverside Drive on a series of massive masonry arches about 75 feet high, while at the new Jersey approach the roadway strikes the face at the Palisades about 50 feet below the top of the cliff. From this point it rises at a 4 per cent grade to the plaza at Lemoine Avenue. New highways that are being constructed will care for the tremendous amount of traffic that will be carried over this bridge. Realizing the monumental size and conspicuous location of this bridge, the Port of New York Authority is paying special attention to the architectural treatment of the entire structure and approaches so that it will be handed down to posterity as one of the great monuments of the world.

The effect that a bridge has upon the community was thus admirably expressed by "C.D." in "The Brochure series:" "Of all architectural sins, the building of an ugly bridge is perhaps the most egregious. Structures of other sorts may be overshadowed by charitable neighbors or shrouded with trees and vines; but a bridge, whether part of a river landscape in the country, or a thoroughfare and landmark in the city, always ends the vista and fills the eye. On the other hand, a beautiful city bridge, stately and monumental, often affords, with the sweep of its arches, the only graceful structure among the surrounding marts; while in the country it may complete and humanize, with the touch of man's hand, a natural scene, and thus become an architectural achievement that is a joy more likely to 'endure forever' than most objects to which the trite phrase has been applied; for thoroughfares of travel when once established are inflexibly conservative."



GROWTH OF LENGTH OF SPANS OF SUSPENSION BRIDGES SINCE 1800

Courtesy, Port of New York Authority

STRUCTURAL FEATURES OF SOME MODERN AMERICAN CHURCHES

BY
EMIL PRAEGER, ENGINEER
Of the Office of Mayers, Murray & Phillip, Architects

EUROPE has always possessed a lure for students and lovers of architecture, and especially of church architecture, but the time is not far off, if it is not now here, when Europeans will profit by studying the church architecture of America. Although the ritual of the church service has changed less with time than have many other customs, the method of church building seems to be keeping pace with other changes in methods of doing things which have been taking place in recent times.

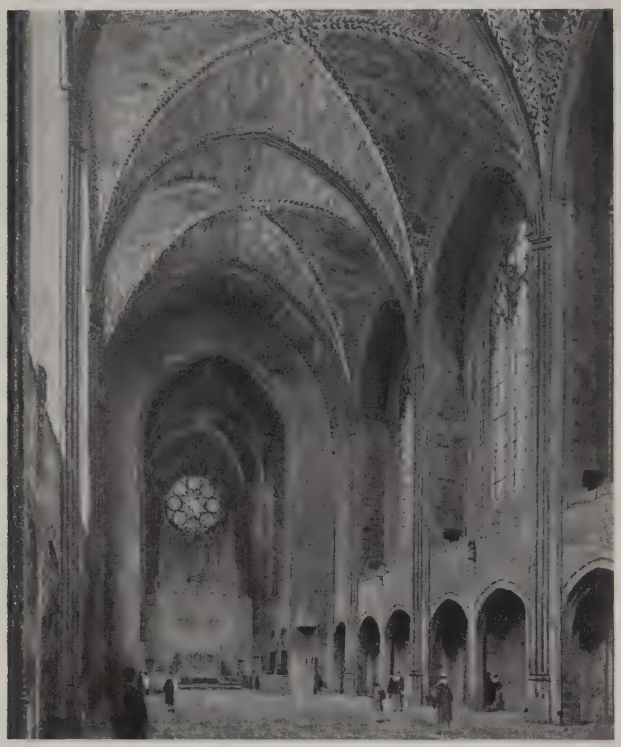
The reasons for this condition are not difficult to determine. In the construction of the mediæval churches, many years and often centuries were spent in finally completing a building. Even in small towns and rural places, the building of a place of worship often represented the chief lifetime labors of a group of workmen, and under these conditions it is not surprising that the workers took an extreme interest in the task, in many instances approaching the attitude of an artist towards his masterpiece. As evidence of this one need only realize that the exquisite carvings of wood roof trusses, pews, chancel and other furniture seen in the old rural churches are the result of the painstaking labors of village or town carpenters and craftsmen.

How different are conditions in this country today, with respect to both rural and urban churches! The village carpenter or mason would find it difficult to supply gasolene for his automobile if he had to depend chiefly on the building of the community church for his life income, and parishioners are too up-to-date to sanction obsolete procedure. It does not follow that there are no examples of well designed small churches in this country; on the contrary, there are some excellent examples, but they are exceptions. In these, moreover, aside from the time element, there have been no great changes in methods of design or construction from those followed by the older church builders. In the larger churches, it is now neither practical nor necessary to build piecemeal, and the method of building is bound to have an effect upon the finished structure. In the cases of the old cathedrals, highly trained engineers were not available to the architects, but internal and external forces and stresses in structural members were understood and considered, although not always adequately. Failures were not unknown, and much knowledge of building methods was gained through this not altogether satisfactory method of "learning." The paths of forces and stresses in a Gothic structure are not as easily defined as is the case in a framed building, and therefore, contrary to a somewhat general opinion, the solutions of their problems are necessarily usually more complicated than is the case with steel framed buildings, the post-lintel-and-truss type.

During the past few years there have been some very excellent churches constructed in this country, and there are now four or five being erected in New York, the construction of which is of interest to the architect as well as to the crowds that watch the steam shovel or steel derrick. These churches may be divided into three constructional classes; namely: (a) Masonry Framed, (b) Reinforced Concrete Framed, and (c) Steel Framed.

The first class represents the traditional method and needs little introduction. Walls, piers and buttresses are constructed of brick or stone masonry, and the roofs are supported by trusses. In some cases there is a ceiling over the nave constructed of stone, tile, or plaster, in which case simple wood or steel roof trusses are used. Where there is no ceiling, the trusses are generally of wood, of the hammer beam type, which exert a thrust on the buttresses in the same manner as do arch ceiling ribs. The Cathedral of St. John the Divine, Cram & Ferguson, architects, now under construction on Morningside Heights, is an excellent example of this class of construction. As an example of the second class, there is the new edifice for the Church of the Heavenly Rest and the Chapel of the Beloved Disciple, now being built on upper Fifth Avenue, of which Mayers, Murray & Phillip are the architects. Of the third class, the "Riverside Church," on Riverside Drive, and the Temple Emanu-El on Fifth Avenue, are examples. The architects for the former are Henry C. Pelton and Allen & Collens, associated, and for the latter Robert D. Kohn, Charles Butler, and Clarence S. Stein, associated; Mayers, Murray & Phillip, consultants. An account of the construction of the latter building was ably presented in the July issue of THE ARCHITECTURAL FORUM.

In the case of the Cathedral, the foundations are of concrete, and the nave floor is of tile vaulting. The exterior walls are of granite, and the smaller interior piers are solid granite, while the larger piers have granite cores faced with limestone. The ceiling, a series of structural tile vaults with the first course of an acoustical composition, is supported by limestone ribs. Steel roof trusses and steel purlins support the concrete roof slabs to which is secured the lead-coated copper roofing. While the building is extremely modern in regard to equipment and appointment, the type of construction follows that employed in the older European churches in which masonry buttresses resist the thrust of either the hammer beam trusses or arch ribs. There are, of course, details developed for this building which are not common,—as, for example, the method which will probably be used for supporting the central tower by intersecting stone arch ribs,—but the main



Interior, Church of the Heavenly Rest

difference between the methods of building this and the older structures lies in the time consumed in building and the tools and apparatus employed. Modern tools have made it possible to use stones much larger than could formerly be handled easily, with the result that solid piers of great dimensions are now possible.

In the smaller piers of the Cathedral of St. John the Divine, the blocks are 5 feet in diameter and weigh approximately 4 tons each, while in the larger piers, stones weighing as much as 8 tons each were used for the cores, and these were bonded with the limestone facing. In the European churches a usual method of constructing piers was to build a face stone shell and to fill this shell with rubble masonry. Failures due to this type of construction have been only too numerous, and the recent experience at St. Paul's Cathedral in London should be a warning against use of this method. The steel scaffolding of the nave of St. John's, of an original and unusual design, was developed to meet existing conditions. As the structural tile floor of the nave, which was constructed some years previously, could not have safely supported the heavy constructional loads, it was found necessary to concentrate these loads upon the foundations of the nave piers, and therefore the ordinary timber scaffolding could not be used. The

Church of the Heavenly Rest and Chapel of the Beloved Disciple, New York

Mayers, Murray & Phillip, Architects

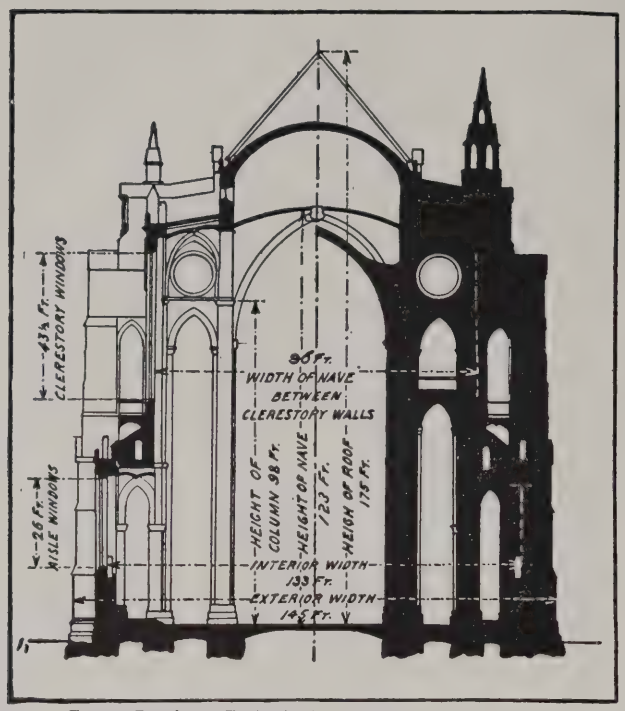
equipment of the stone plants of the Cathedral is modern in every detail, much of the apparatus having been developed to meet the requirements of this particular building. The interest shown by the workmen is unusual for present-day construction work. This care and interest are bearing fruit, and there has been much favorable comment regarding the resulting stonework.

Most large churches in this country have been constructed following the same general principles as St. John's,—for example, St. Patrick's Cathedral and St. Thomas' Church in New York, to name only two. Where special or unusual conditions do not dictate otherwise, there is no objection to continuing the use of older methods of construction, especially for churches of Gothic design. In the construction of the church of today, local conditions may be such as to require a modification of the mediæval methods of construction. In the case of the Church of the Heavenly Rest and the Chapel of the Beloved Disciple, for instance, the imposed conditions were numerous and not easily met. A site had been purchased on the southeast corner of Fifth Avenue and Ninetieth Street, facing Central Park. The building committee was composed of men who, in addition to having an intimate knowledge of church design, had an ambition to build a church which, while

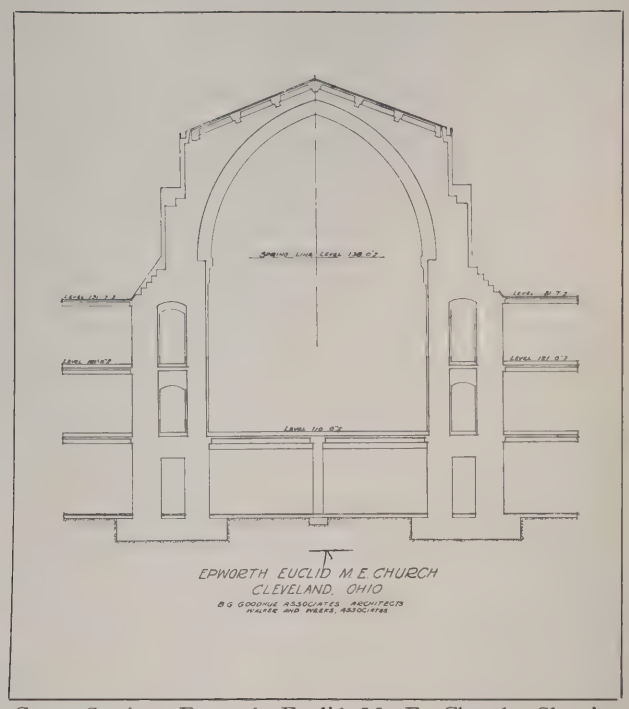
Construction, Showing Formwork for Piers and Arches. Stonework of Front Under Way. Church of the Heavenly Rest, New York

Church of the Heavenly Rest Nearing Completion

Mayers, Murray & Phillip, Architects



Cross Section, Cathedral of St. John the Divine
Cram & Ferguson, Architects



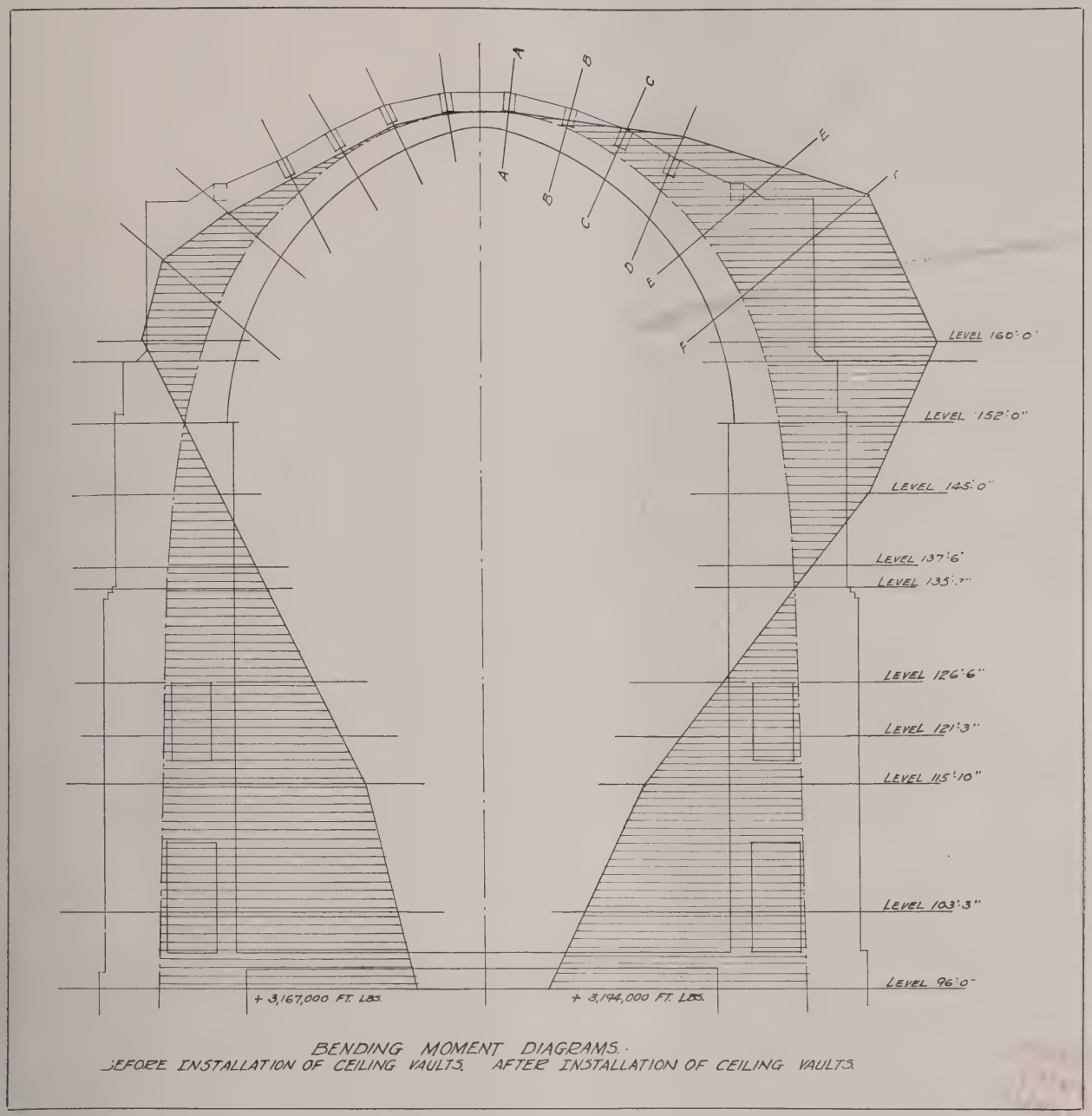
Cross Section, Epworth Euclid M. E. Church, Showing Adjacent Sunday School Floors

Gothic in character, should be American in style and would typify the spirit and trend of the present. If at this time I pay tribute to the late Bertram Grosvenor Goodhue, whose ambition it was to create an architecture of the present rather than a copy of the past, I trust that I shall be pardoned. It was always gratifying to Mr. Goodhue to have his designs referred to as "American" in style,—a term that was coming into almost general use in connecnection with Mr. Goodhue's buildings at the time of the death of this eminent architect. He has sown the seed of his genius, and those who follow are bound to profit by his influence.

Considerable time was spent on preliminary studies for this church, and many different schemes were tried before working drawings were started. In addition to pencil sketches, perspectives rendered in wash, water color and oil were made. Numerous models were made both with plasteline and cardboard until finally a scheme which met all requirements was evolved. In studying this problem the use of models proved extremely helpful. At first it

Cathedral of St. John the Divine Under Construction

Interior of Epworth Euclid M. E. Church, Cleveland



Section and Bending Moment Diagrams of Nave Ribs, Church of the Heavenly Rest, New York
Mayers, Murray & Phillip, Architects

was proposed to build a tower at the front elevation, but by the study of models it was found that if apartment buildings of the usual height were later constructed adjacent to the site, the church tower would be dwarfed in comparison.

The site selected has a frontage of 100 feet on Fifth Avenue and 255 feet on Ninetieth Street. The church proper will have a seating capacity of 1,000, and the chapel will seat approximately 200. Under the nave there are crypts and a mortuary chapel. At the east of the church is a parish house, which contains the heating and other mechanical equipment in the sub-basement, a gymnasium in the basement, an auditorium on the main floor, while the five additional floors are divided into various guild rooms and offices for the working departments of the church. The parish house is similar in structural requirements to a modern club or office building and was constructed of steel frame with concrete floor arches and with limestone curtain walls; this section presented no unusual problems. The structural problems of the church proper, however, were more difficult of solution. The first condition imposed was that every pew have an unobstructed view of the altar. To accomplish this, all pews had to be placed between the main piers, and this required a clear space between faces of opposite piers of 46 feet. Although there are some few Gothic structures of greater span than this, they are extremely rare. In addition to this requirement, there

Construction, Church of the Heavenly Rest

was a restriction as to the height of the roof line above the curb level. For the central span, as here required and for other architectural reasons, it was necessary that the clear height of the nave ceiling be not less than 80 feet, so that, after allowing for the thickness of the ceiling construction, only 3 feet, 2 inches was available for roof construction at the crown. The usual type of roof construction for Gothic churches consists of wood purlins and wood trusses which form a comparatively light structure. With this type of construction, the vertical reactions of the trusses assist the buttresses in resisting the thrust of the ceiling ribs. This is not the case with the church now under construction, as wood construction is not permitted by the New York Building Department, and poured concrete was used for the roof slabs and beams. The slabs are of special composition with nail-retaining qualities, which material is also here desirable because of its light weight, being only little more than half that of stone concrete. Copper, coated with lead, was used for the roofing, making a light-weight, permanent, and beautiful finished roof. The roof slabs are supported by gravel concrete beams spanning between the main nave ribs. The latter ribs occur at each of the nave piers, and are 28 feet, 4 inches on centers. It was the construction of the ribs and piers which offered the gravest structural problem. In most Gothic churches, the arch ribs support only the ceiling, and the structural roof, as noted previously, is supported independently. Even under these loading conditions, great buttresses are found to be necessary. In the case of St. John's, the clear span between the nave piers is approximately 45 feet, while the distance from the interior faces of these piers to the exterior faces of the buttress is approximately 50 feet. The Liverpool Cathedral, another great modern structure, has a nave width of 40 feet between piers, and a buttress depth of approximately 50 feet. In both instances it is seen that the effective depth of each buttress is greater than the clear span of the supported arch rib.

At Heavenly Rest the entire depth available for each buttress at the base, instead of being greater than the clear span between piers, is less than one-third of this dimension. Considering the fact that the value of desirable city property is constantly increasing, it is probable that few city churches will be constructed in the future with buttresses utilizing a space more than twice the width allotted to pews.

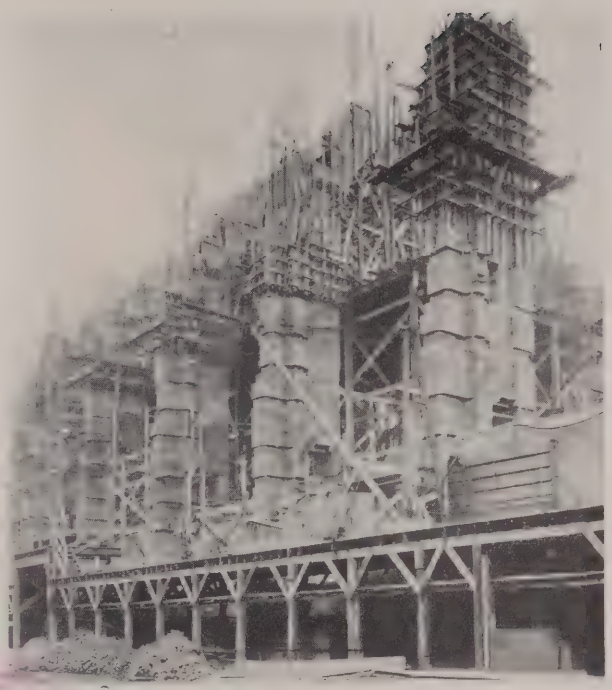
The limitation of height of roof line and the desired height of ceiling made it necessary to devise a scheme whereby the cross ribs would carry the roof load in addition to the ceiling load. The limited depth available for the buttresses, however, made this scheme, if designed according to the usual theories of masonry arch and buttress construction, out of the question. The depth of buttress depends on several factors,—namely, the span and curvature of the arches, the amount of load carried by the arches, the distance from the base to the intersection of arch and buttress axes, and several other factors. Because of the long clear span and the extremely unusual loading conditions just noted, the thrust upon the piers would be much greater than is generally the case, and an enormous depth of buttress would be necessary to resist the thrust of a voussoir or plain concrete arch rib designed for these conditions. At Heavenly Rest, with a greater clear span and greater loading conditions than at either St. John's or Liverpool Cathedral, the total depth of buttress from point of moulding to finish exterior surface

Corbels to Receive Spandrel Wall Arches and Ceiling Vaults

is only 15 feet, 2 inches, as compared with 50 feet for the latter structures. In order to meet these conditions satisfactorily, it was necessary to study the structural problem from a different angle, and numerous schemes and extensive calculations were made. The scheme finally adopted, however, entirely satisfies all loading conditions without in any way encroaching upon the original allotted dimensions. It was found necessary to use reinforced concrete and to consider each main pier and arch rib as a continuous bent reinforced concrete beam. In other words, one pier and half the rib between opposite piers are considered as a bent cantilever beam supported at the base, with the free end at the crown. There were other possible methods of solution, but this method proved most desirable.

The piers and ribs have varying amounts of continuous reinforcing, as required by calculations, and opposite piers are tied together with a wide tie at the nave floor, forming a continuous frame. These ties incidentally also act as floor girders. It was necessary to investigate the ribs under two different conditions of loading: first during the erection of the building after the roof was constructed but before the vaulted ceiling was in place; and second, after the structural tile ceiling and its stone ribs took bearing against the piers. The piers and ribs were completed in six or seven pourings, with construction joints designed in accordance with the nature of the stress at the particular section. There is a construction joint about 14 feet on either side of the crown, another near the spring, and others at convenient locations on the piers. Considered as a column, the ribs are subject to direct stress of compression due to dead weight and roof loading. Considered as a beam, the bending moments produce tension on one side and compression on the other side of the neutral axis. At the crown the only bending moment is that caused by temperature changes and secondary stresses caused by possible deflection. From the crown to the buttresses the bending moment is negative (that is, tension is at the top of the section) and increases in intensity gradually to a maximum at approximately Elev. 162, where it begins to diminish until it changes sign at Elev. 152, before the vaulted ceiling is in place, and at Elev. 134 after the vaulted ceiling is installed. Below this level the sign is positive, or in other words, the bending moment produces tension on the interior and compression on the exterior sides of the piers. It was decided to start the reinforcing 4 feet under the nave floor, so that at this location there can be no tension, and therefore the compressive stress due to vertical loading must at least counterbalance the tension due to bending. Knowing this, the bending moment at the base was determined, and then the crown thrust or tension could be computed. With this known factor the bending moments and shears at any other section could be determined and the stresses in the concrete and reinforcing computed. A rich mix of concrete was used, and very rigid supervision and careful control of material were maintained, especially during the pouring of these principal members. The cement water ratio and other modern methods were followed throughout the work, and laboratory tests showed an unusually uniform resultant concrete.

Tops of Ribs, Roof Slabs and Beams, Church of the Heavenly Rest



Piers Nearly Completed, Showing Recesses for Stone Facing

The interior of the church has a buff sandstone finish, while the exterior stonework is of limestone. Every fifth stone is a bond stone 8 inches thick, and the others are generally 4 inches thick. It was necessary to provide recesses in the concrete piers to receive the bond stones, and these recesses had to be

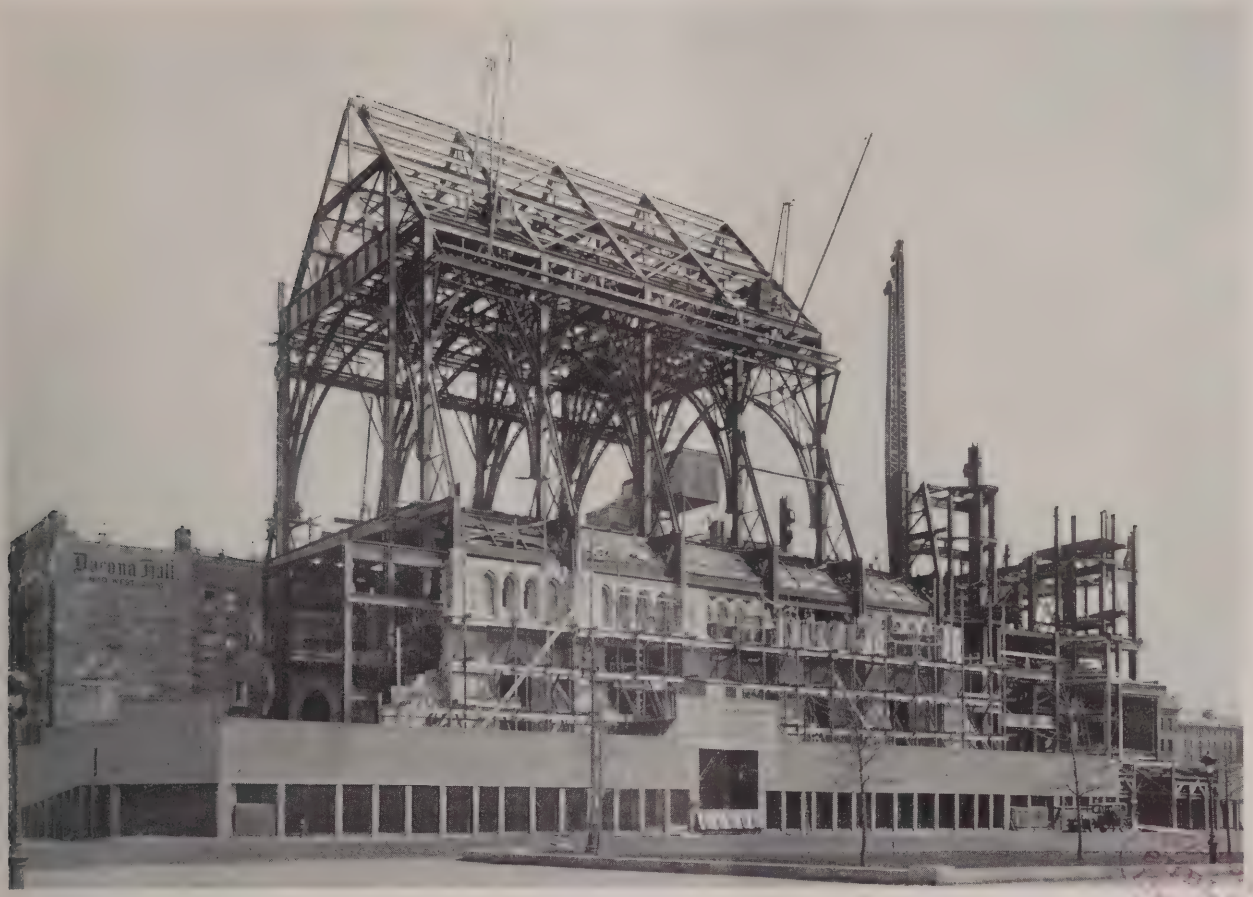
Perspective, "Riverside Church," New York
Allen & Collens, Architects

accurately located before pouring the piers. This required detail drawings showing the exact locations and depths of all stones and the desired provision for bonding them. Dovetail anchor slots and galvanized anchors were also used to insure as nearly a perfect connection of stone and concrete as possible. One inch was allowed for grout between the back of the stone and the face of the concrete. At junctions of concrete piers and brick or stone walls, the concrete was toothed so that the masonry courses bonded exactly with the concrete. Skewbacks were provided on the concrete piers at the springs of all arches, ribs, vaults, etc., and in addition, corbels were provided at different levels projecting into the spandrel walls in such a manner that the weight of these walls was transferred to the concrete piers, thus tying the entire structure together.

Although the stone was not a factor in the structural design, tied and bonded to the concrete piers as it is, it unquestionably adds considerable strength to these members, and can be considered as an additional safety factor. The stonework was not started until after the concrete had been poured for several weeks, during which time the concrete was kept moist (especially in warm weather) by allowing water to trickle over the top of the section last poured.

In view of the fact that there have been a number of buildings constructed in recent years in which the stone facing has cracked quite badly, this subject was given careful consideration. The causes of such cracks may be traced to unequal settlement of the stone due to unequal shrinkage of the mortar joints of the stone and brickwork, differences in the rates of expansion and contraction between facing and backing with the temperature changes, or to other similar causes. Such a movement might load some stones beyond their capacity and therefore cause unsightly cracks. To overcome this condition, a continuous lead shield in which a corrugated lead sheet is inserted was placed in alternate bond courses on top of the bond stones. The thickness of this pressure-relieving pad is ¼ inch, and as the stone joints are ⅜ inch, it was possible to install a leveling bed of mortar either on top of or under the pad, or in both places if found necessary. If there is any unequal movement of stone, this movement will not act over a height greater than the distance between the pressure-relieving pads, and there is more than enough elasticity in this material for it to act as a spring and prevent excessive load coming on any one stone or portion of a stone. The pads are kept back from the face of the stone about ⅛ inch, and this space is filled with a skim coat of pointing mortar. No difficulty was experienced by the stone masons in fitting the various stones into the grooves which had been provided in the concrete piers. As to economy, I am sure that the cost as now built would compare favorably with that of any other method of construction for a church of this size and character. The time required to build this type of frame should, under ordinary conditions, be less than that required for the usual type of masonry construction.

The architectural features have not been touched upon, and these should furnish the basis of some interesting studies in the future. The mechanical details are also in keeping with the best modern practice, and there are many features entirely original with this building. A careful study was made of the lighting requirements, with the result that use of the usual ornamental nave lighting fixtures has given way to use of a system of concealed lighting. In the design and construction of Heavenly Rest, the fact that the architects were endeavoring to build a monument to last for centuries was never lost sight of. Due to New York's climatic conditions, this is a greater problem than the builders of the mediæval European cathedrals faced. The architects feel reasonably sure, however, that this edifice will be structurally sound for ages, and perhaps some day will be pointed out as an example of the church architecture of the early twentieth century. There remain, nevertheless, further opportunities for development. The tile ceiling, while excellent from an acoustical standpoint, adds considerable expense and might be dispensed with under certain conditions. In this case, the structural concrete roof could be designed to form also the finish ceiling with decoration applied directly to the concrete or to an acoustical application, if such material is found necessary. This method of construction was followed in the frame of the Epworth Euclid M. E. Church, recently completed in Cleveland. Here the problem of resisting the arch thrust was not so complicated because the roofs and floors of the Sunday School building adequately take care of these reactions. The arch rib and supporting piers were faced with cast stone resembling limestone.

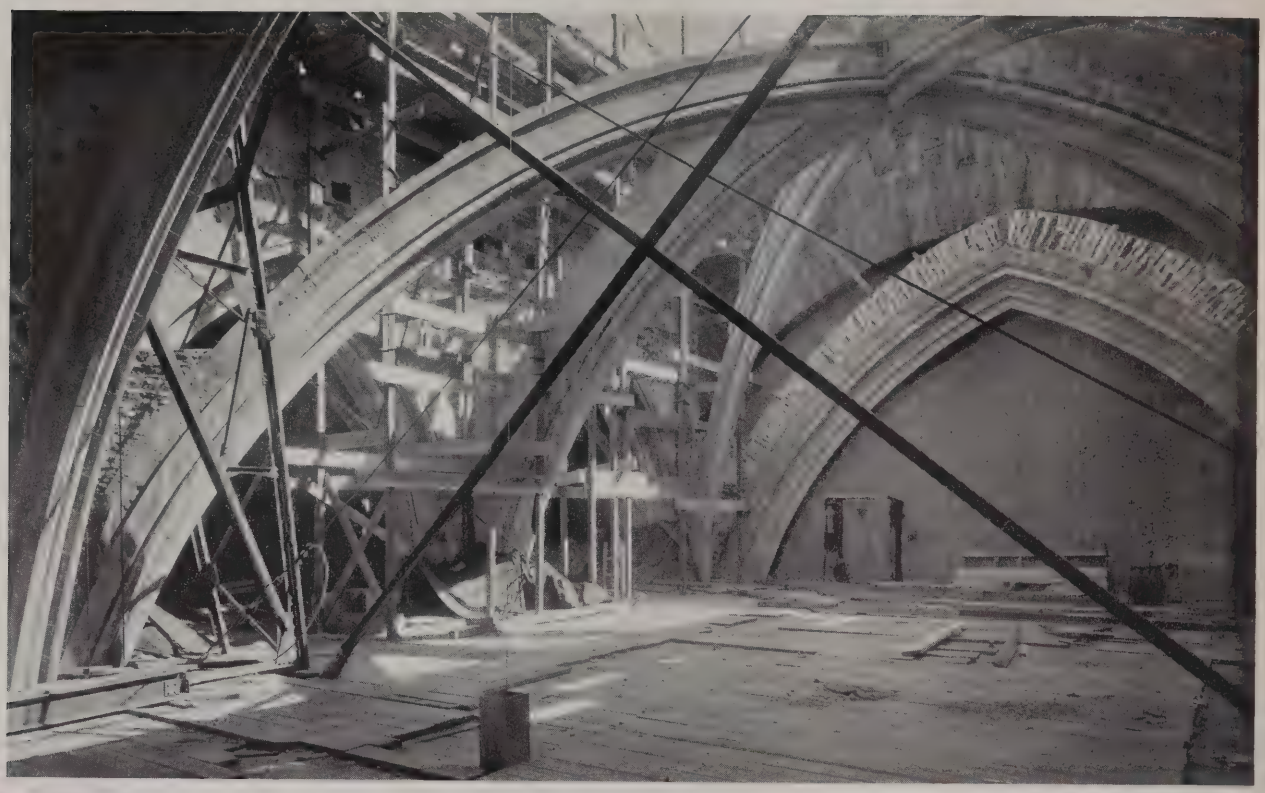


Construction Showing Steel for Roof and Ceiling. "Riverside Church," New York
Allen & Collens, Architects

Mention has been made of two structures in which reinforced concrete, in the form of arches or arch ribs, has played an important structural role. There have been many other buildings designed by the firm with which I am connected, where conditions have been such as to make the use of this type of construction advisable,—for instance, the crossing arches and piers of St. Bartholomew's Church, New York; the Trinity Lutheran Church at Fort Wayne; the chapel for the University of Chicago; and others,—so that it is not an experimental method. Reinforced concrete was used in each case only because it best fitted solving the problem at hand.

As the next step in the development of modern church construction, the possibility of entirely omitting the facing material from the structural piers presents itself. With the advance in our knowledge of reinforced concrete and with improvements in the finished product, as to both color and texture, this step will follow, and indeed it has already been attempted in several churches in California, as well as in Europe. As a still further development, the creation of an entirely new style of architecture might follow, a style developed to fit our special needs and conditions. Reinforced concrete will unquestionably play an important part in this development, as it offers unlimited opportunities to the designer's imagination. At the same time, it is not necessary to throw tradition to the winds, to forget everything that has been accomplished in the past and try to create a new architecture overnight to fit use of this modern material. We should not become slaves to a material but rather develop new forms slowly and as the requirements at hand seem to demand. The recent examples of modernistic French churches built of reinforced concrete are interesting and ingenious, but they are hardly appropriate for present American conditions.

In regard to the third type of church construction,—namely, the steel frame,—I cannot quote from personal experiences, as the office with which I am connected has not used this type of construction to any great extent. However, if steel, stone, brick, wood, or concrete or any other material is best suited to the particular conditions at hand, there is no reason why any or all of these materials should not be used. Steel has proved, beyond dispute, to be one of the strongest and most dependable building materials known. Its strength per square inch, both in tension and compression, is greater than that of any other practical building material. If, by its use, structural problems can be solved which would otherwise prove insolvable, it would be unwise not to use steel for a church, as well as for an office building, even though this material was not used in the construction of mediæval churches and cathe-



Limestone Ceiling Ribs, Weighted with Concrete or Rubble Masonry, Cathedral of St. John the Divine
Cram & Ferguson, Architects

drals. Such use of steel is now being made in the construction of the Riverside Church and in building the Temple Emanu-El. In both instances, maximum capacity was required of the areas available, again rendering use of the traditional methods of construction impossible. In the Riverside Church a total seating capacity of approximately 2,500 was required, and practically all seats had to have an unobstructed view of the pulpit. The total width of the property is only 100 feet, and a clear width of 60 feet between buttresses was found necessary. From the inner face of the buttress on the west to the property line is 22 feet, while the similar dimension on the east is only 18 feet. The height of ceiling above the nave floor is 102 feet. To satisfy these conditions, impossible with stone masonry, the use of structural steel was decided upon. Steel columns extend through the nave piers and support steel ceiling ribs and steel roof trusses. The ceiling is tile of the color and texture of limestone and having excellent acoustical properties. A huge tower is to be supported by heavy steel members, and by thus resorting to use of modern methods and materials, maximum strength is gained with a minimum sacrifice of space. The time required for such building is less than would be needed for solid masonry construction.

The Temple Emanu-El is not a Gothic type of structure, but here again the condition was imposed that all pews have an unobstructed view of the pulpit, and in order to accomplish this for a seating capacity of 2,500, a clear span between nave piers of 77 feet was required, leaving only some 13 feet for the total width of each pier. Steel roof trusses were used to span the nave, and the trusses are supported by steel bents designed to withstand safely the horizontal component of the wind load, as well as the vertical reactions of the trusses. The steel bents are encased in concrete, and the stone facing is then anchored to this frame by means of anchors and anchor slots cast in the concrete.

While commercial buildings have become highly specialized and modernized, church design is also undergoing changes, and how near we are now to the best solution, time alone will tell. The structural features of only a few important churches have been described here, and while these matters are extremely important and at times offer problems difficult of solution, they should not influence or restrict the architect to too great an extent. With advance in our knowledge of structures and structural materials, the architect will be obliged to modify his ambitions less often, and the more capable we become as engineers, the fewer will be the restrictions placed upon the architect. We are now living in an age of specialization, but to obtain the full benefits of specialization, we must also have close coöperation between the various specialists. Without the creative skill of the architect, the engineer would have fewer opportunities to exercise his ingenuity and technical skill. Coöperation between architect and engineer should exist from the inception of the design, as it may be difficult or impossible to compromise after a scheme has been adopted. When such exists, the best results will be obtained.

THE PARABOLIC ARCH AND VAULT

BY
FRANCIS S. ONDERDONK

THE parabolic arch is both logical and beautiful Hundreds of concrete bridges show its dynamic grace. If spanning a void is the main problem of architecture, bridges may be considered as showing us an ideal solution, for where could a form undergo a more severe test as regards its æsthetic value than when placed to serve a utilitarian purpose in a natural setting of rhythm and serene beauty? The parabolic bridge has become a standard type, not only because it is the most economical type, but also because the beholder senses its beauty. If it be acknowledged that sincerity is an essential element of the beautiful, it is significant that bridge builders prefer the parabola. Brick and stone construction would be too cumbersome, steel too skeleton-like to produce such elegant, thrilling arches as those shown in Fig. 8. Only ferro-concrete, with the advantages of steel and stone, can be used in quite this way.

In reinforced concrete, columns and beam, walls and vault become one. For this reason the rigid frame, which in Europe is used so frequently for large halls, is typical of ferro-concrete. This bent has structural advantages due to the continuity of bending. Some designers place such a frame on hinges, while others connect it rigidly with the foundation. The hinged type has columns tapering downward, i.e., growing narrower toward the floor, because stiffness must be increased at the top, and there the column is widest (Figs. 1, 5).

As in former transition periods, the old forms are resurrected in the new material. The now dominating type of frame, two posts connected by a beam, is reminiscent of use of the old materials, just as the V-frame (Fig. 3) is due to the traditional type of roof. Gravity demanded vertical piles of stones or bricks to avoid centering; wood and steel encouraged angular outlines, but "liquid stone" requires no straight lines. Its form can express the structural facts: sides and top, walls and roof are one. The curved haunch (Fig. 3) is much more pleasing than the angular haunch (Fig. 2), which is a product of the "wood centering" style.

The logical type of ferro-concrete "style" is an arch or a vault that springs from the ground or floor, serving in its lower parts as wall, and in its top part as ceiling (Fig. 4). Now the arch which curves out gradually from the base to the crown is parabolic; near the base it is almost vertical, and it then curves more and more until at the top it approaches a semi-circle (Fig. 9).

Structural Advantages of the Parabola. Parabolic arches are economical; with a given load they require the smallest amount of material. The thrust curve of an arch carrying an evenly distributed load,—and that is the most frequent type of load in a building,—is a parabola. A parabolic arch can have a smaller section and less reinforcing than any other arch to support a given load. To quote from J. C. Austin: "The use of the principles of the arch, particularly in reinforced concrete, should be exceptionally well adapted to our structures. It is a fact that, generally speaking, no more than 37½ per cent of the concrete in a straight beam or girder is figured to resist compression, whereas close to 100

Fig. 1. The Planetarium of the Gesolei Exhibition, Dusseldorf

Fig 2. Lumber Storehouse, Kassel, Germany
K. V. Brocke, Architect

Fig. 3. Covered Lumber Court, Kassel
K. V. Brocke, Architect

per cent of the concrete in an arch is usually effective in resisting compressive stresses. The arch is one of our most economical structural units." Professor C. Korner recommended that vaulted halls be more frequently designed to follow a parabolic curve, because of all simple curves the parabola alone designates the vault of greatest stability, as investigations have proved. The designer of the Breslau *Markethall* (Fig. 9) chose the parabolic arch because it best approximated the line of thrust. If it be admitted that architecture is to a large extent the symbolic expression of the conflict of forces act-

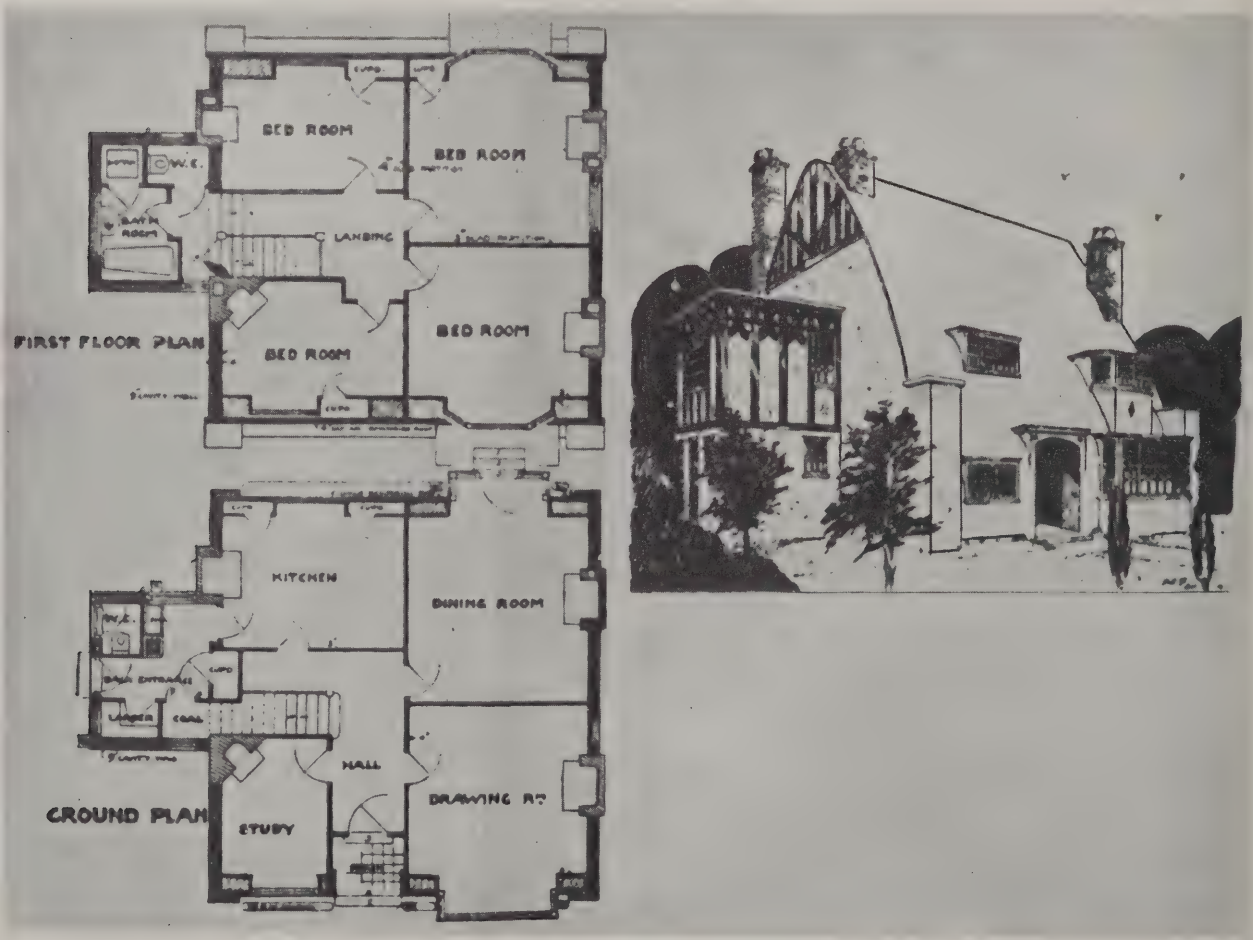


Fig. 4. A Ferro-concrete House in England

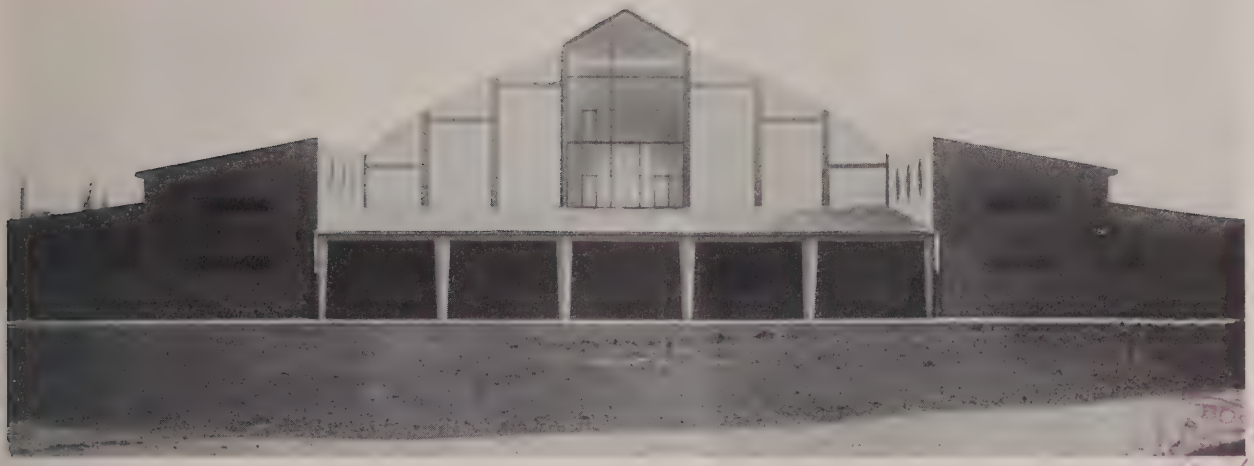


Fig. 5. "City and County" Hall, Magdeburg, Germany
Bruno Taut, Architect

ing in a structure, then the parabola is unquestionably to play an important role. The parabola can be called the resultant between gravity and a constant horizontal force. Gravity creates a parabola when drawing water earthwards, be it pouring from a horizontal spout or thundering over Niagara Falls; gravity creates a catenary,—a curve very similar to a parabola,—when acting on a flexible material of uniform weight, such as a chain or a ribbon. The arches of wood (Fig. 11), brick (Figs. 12, 13 and 14), and stone show that the parabola and similarly shaped curves are being utilized in modern architecture generally and are not restricted to the use of ferro-concrete. The engineer creating a bridge and the architect designing a lofty hall simply "listen in" to nature when they choose a parabolic arch.

The Æsthetic and Symbolic Value of the Parabola. Architects are inclined to disagree when the question of beauty arises. An object that is highly praised by some, is condemned as ugly by others. It will be therefore helpful to investigate the æsthetic qualities of the parabola. Greek art, generally accepted as the highest standard, created the sections of its mouldings as approximate parabolas, hyperbolas and ellipses; the echinus section of the Poseidon Temple in Pæstum, a half-parabola, is one example. The parabola is a curve of changing curvature,—according to John Ruskin a characteristic of all beautiful curves.

Theoretically the parabola is a curve that never ends,—one end of an infinitely long ellipse; comets follow parabolas through limitless space, and the parabolic arch gives the ferro-concrete style something of the infinite swirl and swing of the universe. To be "in tune with the infinite" has always been man's longing; but our age especially admires the great, the limitless. Lindbergh's flight enraptured mankind because he conquered space,—pushed forward the boundaries in man's struggle with the infinite. Technical achievements and records established at the Olympic games satisfy man's longing to extend his limits. The rhythm of rail and wire has already inspired poets and painters. The architectural expression of this new rhythm, of this urge toward the infinite is, I believe, the parabola—the curve that pays us a visit en route from the infinite

Fig. 6. Twin Villa, Hilversum, Holland

Fig. 7. Interior, Exhibition Hall, Magdeburg, Germany
J. van Laren, Architect

Fig. 8. A Reinforced Concrete Bridge in Sweden

to the finite. As Plotinus' philosophy claims, the apprehension of the infinite in finite figures can produce the impression of serenity. . . . "We have a longing born of the infinite and directed to an infinite desire of the soul which therefore never can fathom itself." We can call the parabola the emblem of man's life; one end here in the finite, the other hidden in the infinite-eternal,—for are we not like comets of hidden origin and unknown destiny? Professor Durant calls our life "our parabola through the world," and A. von Harnack writes: "But where and how the curve of the world and the curve of our own life begins,—that curve of which it shows us a segment,—and whereto this curve leads,—science tells us naught."

Pythagoras considered the realization of simple numerical laws as the source and the essence of the soul's satisfied pleasure in contemplating the beautiful and the true; the parabola's equation is simple. Plato recognized beauty as such in those simple geometrical figures which affect us not by material charm but as representations of spiritual concepts;

Fig. 9. Market Hall, Breslau, Germany
Eng. Kuster, Architect

Fig. 10. Congress Hall, Gothenburg, Sweden

and Plotinus says: "Always that is pleasing which expresses ideas as purely and perfectly as possible. . . . The beautiful object becomes beautiful through the dominance of the spirit, the dominance of the ideal over sensual matter, through participation with reason, which emanates from the divine. . . ." The idea shining through matter is the beautiful, according to Hegel. Another German philosopher, Theodor Fechner, applying these thoughts to the conical sections, called the parabola the symbol of love for the infinite and divine. He compares the focus to the soul, and the rays emanating from it to the periphery he compares to the endeavors of this focus-soul, adding: "The parabola is a serene symbol of love for an ideal, to the non-sensual, to all great and beautiful which,—only attainable in infinity,—entices the soul; all rays sent out by the parabola-focus run in parallel directions to the other focus in the infinite; all desires and thoughts are only directed thereto. On the other hand, no ray which did not emanate from the infinite can fall into the soul. . . ."

Examples. Several large halls which utilize the parabolic arch have been erected in Europe. The airship hangar at Orly consists of a series of parabolic arches connected by horizontal bars forming oblong windows between. The noted German architect, Professor Kreis, designed a pavilion for the

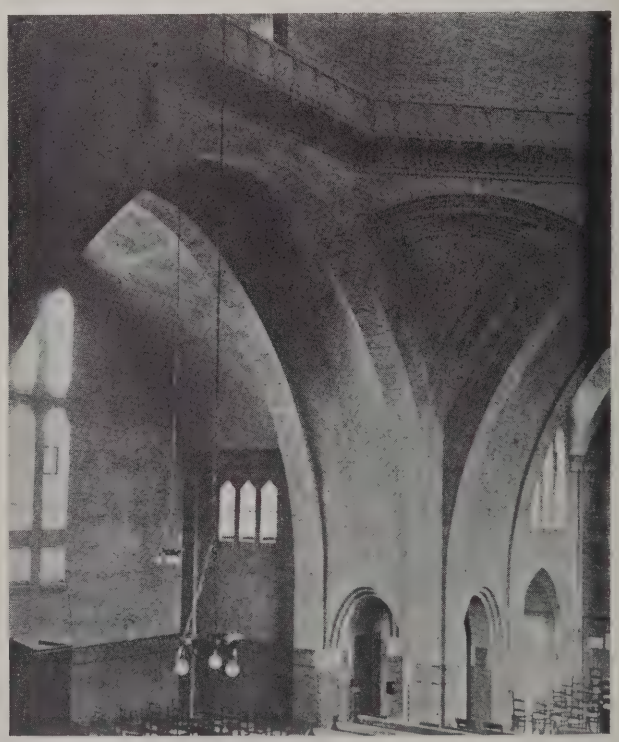
Fig. 11. Interior of Congress Hall, Gothenburg, Sweden

Munich *Farbenschau* featuring an arcade of parabolic arches which demonstrate the charm of unity possessed by that curve. In the interior of the Engelbrekt church, Sweden, Professor Wahlman has made use of the parabola in a group of arches supporting the roof over the four arms at the crossing. He explained that he desired to produce an effect of springiness, such as it seemed impossible to obtain otherwise. These arches are not of concrete, though other parts of the church are. The parabolic arches at the crossing of St. John the Divine, New York, are of huge granite blocks and designed to support a tower; it is significant that they have been incorporated in this otherwise mediæval design. The Congress Hall at Gothenburg, Sweden, is covered by a series of arches which support stepped-back vertical windows (Figs. 10, 11). In Holland the Utrecht Post Office, as well as several churches and apartment houses, has been built with approximately parabolic vaults or doors and windows (Figs. 12, 13). Two Catholic churches recently erected in Germany,—one by Professor Dominikus Bohm in Bischofsheim and the Pallotiner church in Limburg, by J. H. Pinand,—have parabolic vaults as naves. They demonstrate that not only Theodor Fechner sensed the parabola as "the curve of idealism"!

Details of Execution. Parabolic doors can be arranged as sliding or as revolving doors. Parabolic windows can receive an upright center-post, around which two wings turn on hinges, while the upper segment turns around a horizontal transom bar. The almost circular segment at the crown of the parabola admits more light and air than the point of the Gothic arch. When still more light near the ceiling is needed, the spandrels could be pierced and filled with tracery or vertical posts as seen in so many bridges (Fig. 8). The inclined lower portions of the parabolic arch seem to be an obstruction. This may be just prejudice.

Fig. 12. Shops, Hilversum
J. van Laren, Architect

Editor's Note. This article was prepared by the author from his book, "The Ferro-Concrete Style."



Figs. 13 and 14. Interior of Church at Nijmegen, Holland
H. Thunnissen, Architect

BETTER STUCCO HOUSES

PART II

BY

ARTHUR C. ALVAREZ

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF CALIFORNIA

UNDER this title in THE ARCHITECTURAL FORUM for August, 1928, the writer called attention to the widespread and increasing use of the timber-framed stucco house because of its many architectural possibilities, ease of construction and comparatively low cost, and he alluded to the great economic value of improvements in structural design whereby its safety in severe earthquakes and hurricanes would be assured and its life under the harsher weathering agencies, such as excessive freezing or rain, greatly prolonged.

The type of structure under consideration is the dwelling of three stories or less in height. In the preceding article, the chief structural factors involved in the selection and preparation of the site and in the design and construction of the foundation and underpinning were presented. The present and a subsequent article will continue to deal exclusively with questions of structural design involved in other parts of this type of building, such as the framing, chimneys, stucco covering, roof covering, openings, all considered from the point of view of increasing the building's resistance to the hazards already mentioned. These questions should be of special interest to architects, because very great benefits are to be derived from giving adequate attention to details of structural design, rather than leaving the matter to the carpenter in charge, as is too often done.

Framing. When the height of a building does not exceed two stories, two methods of arranging floor joists and wall studs are possible,—(1) "balloon" construction, and (2) "story" construction. In balloon construction the studs of the outside walls are continuous from the sill of the concrete foundation to the plate on which the rafters rest. In story construction the frame is erected one story at a time, the continuity of the studs being interrupted at each floor level by wall plates and floor joists, as illustrated in Fig. 8. Balloon construction is not feasible for a structure of more than two stories because of the excessive lengths of studs required, and because the cost of erection would greatly exceed the cost of erection by stories. After describing the two types of construction, their relative merits will be discussed. Erection by stories is employed much more extensively than balloon construction, because it is very much easier to execute from the contractor's point of view.

Framing of Floors and Walls in Story Construction. Floors. Referring to Fig. 3, on page 268, THE ARCHITECTURAL FORUM for August, 1928, the joists *fg* at all floors and roof should be anchored very securely to the plates, *EF, AB* and *GH,* rather than be merely "toe-nailed," a common practice, which produces a very weak joint. The structural advantages of such adequate anchorage in case of earthquake or hurricane are obvious. A very effective joistplate joint can be arranged by using a 2 by 6-inch pine splice about 2 feet long, as shown by *e* in Fig. 3, and by *e* also in Fig. 8 of this article. To prevent splitting, the joist should be drilled for four 20-penny nails, properly staggered from joist to splice, and the splice should be drilled for four 20-penny nails to the plate. Thus all nails are arranged with reliable bearing so as to develop their lateral strength in the most effective manner, because at the junction of any two pieces of timber the forces act perpendicularly to the axes of the nails. Wherever great tenacity is required in a nailed timber joint, the designer should arrange the nails and timbers in a similar manner.

In order to insure lateral support, all the joists should be solidly bridged with 2-inch pine, extending from the tops of the splices to the tops of the joists, along all supporting plates, as in *EF, AB* and *GH.* At the outside walls, this bridging should be placed just inside the inner line of the wall plate; it will then serve as a header for nailing the ends of diagonal floor boards, which should be run just to but not under the plate. Vertical shrinkage in the floor boards will then have no effect on the stucco. The cross-bridging of joists, as along lines *JK* and *LM* in Fig. 3, is needed to stiffen the floor. This it accomplishes by distributing any concentrated vertical load to at least three adjacent joists, provided the distance between lines of bridging does not exceed 6 feet, approximately. Such cross-bridging would be much more efficient than it frequently is if it were made 2 by 4 inches in section instead of 1 by 4 or 2 by 3 inches, if care were taken to miter the ends of cross-bridging accurately against the sides of the joists, and if the pieces were drilled for two 12-penny nails at each end instead of being rendered practically valueless because of splitting by driving in two 10-penny nails. The 1 by 6- or 1 by 8-inch flooring boards should be laid at an angle of 45 degrees with the sides of the house; two 8-penny nails at each joist are sufficient. Where the floor plan is unsymmetrical, or the floor area is unsymmetrically loaded, earthquakes tend to twist the entire frame about some vertical axis. When the walls are thoroughly braced, diagonal floor boards are of greater assistance than floor boards at right angles to the joists in developing resistance to such twisting. Diagonal floor boards are more effective also because of the bond they produce between walls and partitions that meet at right angles.

Walls. All studs should be spaced not to exceed

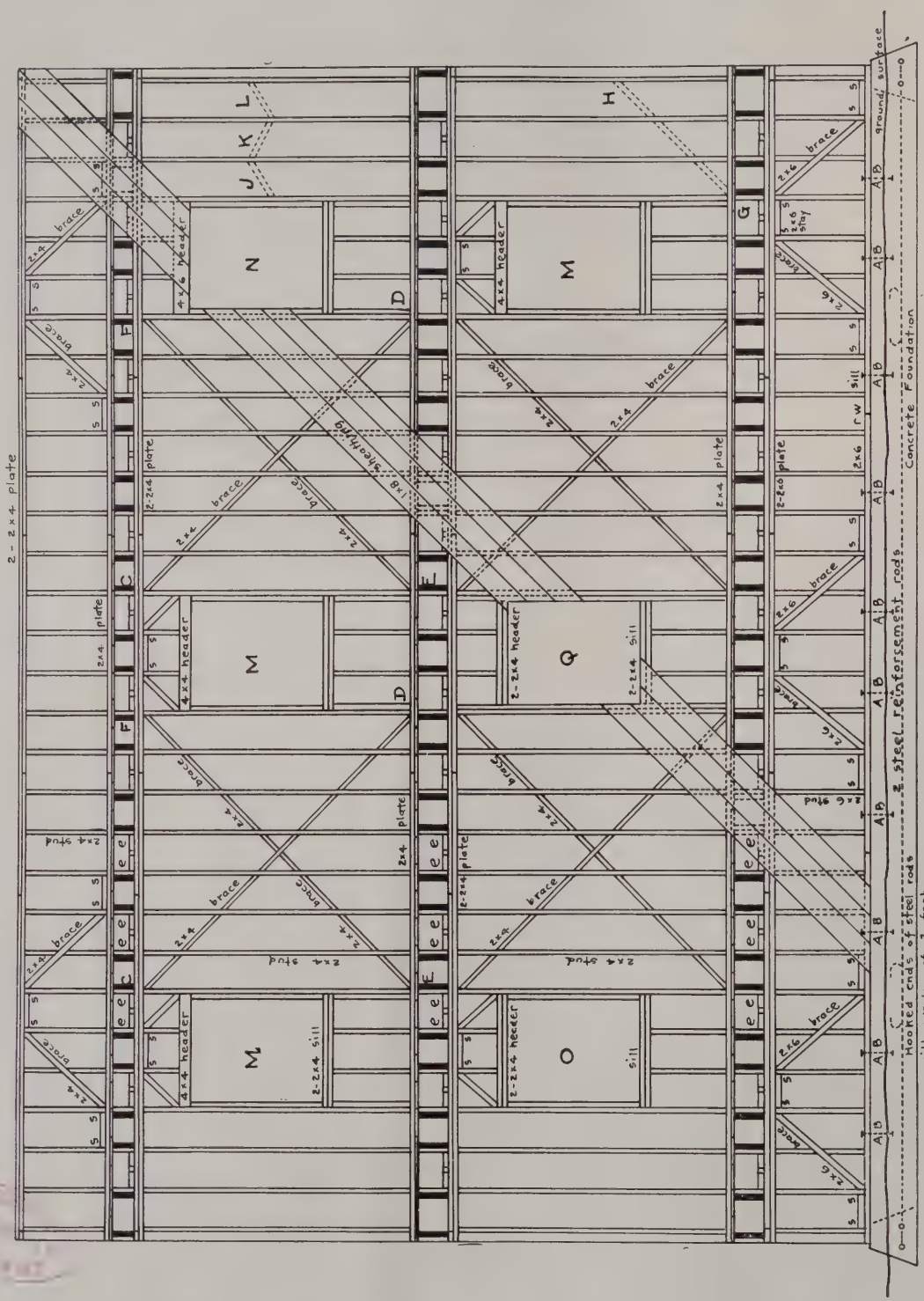


FIG. 8. CONSTRUCTION DETAIL OF THE ELEVATION OF A WOODEN FRAME BUILDING

16 inches. In buildings of one or two stories, 2 by 4-inch studs throughout are sufficient, except that the underpinning of a two-story house should be composed of 2 by 6-inch studs; for three-story structures, 2 by 6- or 3 by 4-inch studs should be used in the first story as well as for the underpinning. Size 2 by 6-inch is preferable to 3 by 4-inch, because there will be relatively less injury when the studs may be notched for plumbing pipes. The upper plate of every story should consist of stud-sized timber, doubled; this facilitates lapping at corners and makes possible long, well nailed overlaps for all straight splices, as shown in Fig. 8, page 746. In each side of each story there should be at least two lines of stud-sized diagonal bracing sloping in each direction, as *CD* and *EF* in Fig. 8. To be effective, this bracing should make an angle with the horizontal not greater than 45 degrees; the smaller the angle, the more effective the bracing, but the line of every diagonal brace should extend continuously from floor plate to ceiling plate, because a brace like *GH* in Fig 8 is only about 40 per cent as efficacious as a brace like *EF*. In the stories above the underpinning, it is better to fit the sections of a diagonal brace between the studs, as shown in Fig. 8, than to cut a great number of studs in order to make the diagonal brace one continuous timber. Stays will then not be necessary at the ends of the diagonal brace which terminate at the plates. Some designers advocate letting into the studs a 1 by 6-inch diagonal brace, but the writer prefers fitting in between the studs the sections of each brace, as just described, because the letting-in involves more tedious carpentering and unnecessarily reduces the cross-section of the studs braced. The studs should not be "toe-nailed" to the plates. Instead, two 20-penny nails should be driven into each stud through each plate; at its ends, to avoid splitting, the plate must be drilled for these large nails. At intervals, 20-penny nails should be driven through the single-stick lower plate to the floor joist system below. At all corners the end studs of both walls should be securely nailed together by 20-penny nails. The sections of diagonal stud braces should be drilled to receive two 12-penny nails at each end, otherwise serious splitting will occur. Depending on the height of ceilings, one or two lines of stiffeners, like *J, K* and *L* in Fig. 8, are necessary where diagonal sheathing is used, because these support the studs laterally against the shrinkage stresses developed when the sheathing dries, and thus reduce the possibility of there being cracks in the stucco. Such stiffeners are necessary also in all partitions. The individual sections should be mitered in, so that wedging action will make the joints very tight. Whenever walls or partitions meet, the opportunity should never be neglected to attach continuous studs in each with 20-penny nails. The drilling to prevent injurious splitting of all such pieces as sections of diagonal braces, stays on underpinning plates, joist-plate splices, joist cross-braces, wall stud stiffeners, etc., can be done at low cost by an apprentice carpenter with an electric drill; in the opinion of the writer, it is well justified by the increase in structural integrity thereby imparted to the frame. In the preceding and following descriptions, for simplicity of statement, only "rough" sizes of timber are given, since these are sufficient for structural purposes. Of course all architects are aware of the necessity of the special sizing required to make all such members as joists, studs, plates, rafters, floor boards, sheathing, etc., of uniform dimensions.

Framing Openings. So simple is this matter that no mention would be made of the subject were it not for the fact that the writer has often seen openings framed as poorly as that shown at *Q* in Fig. 8, where the header, which takes considerable loading from the floor above, is supported only by "toe-nailing" at its ends, instead of being supported positively in the manner shown at *M* and *N*. The ends of the sill also should be positively supported, as shown at *M* and *N*, rather than be merely nailed, as at *O* and *Q*. A single-piece header, as at *M*, because it is stiffer, obviously will support more load than the two-piece header of the same size at *Q*. The trussing above the header at *M* affords a much stiffer frame than the use of merely a deeper header, as at *N* only if the diagonals are well fitted and the center stay is snugly wedged into position. For wide openings, if headroom permits 45-degree angles for the diagonals, trussing is preferable to a very deep joist header, because the shrinkage and time sag in the joist header, by withdrawing support from the floor above, will cause cracking of the stucco and interior plastering. In hurricane areas, very substantial shutters must be provided for all glass openings, because it is doubtful if even small panes of heavy glass in heavy metal casement frames could survive the impact of all the debris flying in the air during a storm. If the architectural design permits, rolling steel shutters are very efficient and, when not in use, may be completely concealed. If wooden hinged shutters are employed, the fasteners and hinges must be of heavy wrought metal attached by bolts, not screws, and the hinges should be bolted, not to the sheathing, but through stucco and sheathing to wall studs set for the purpose.

Framing of Floors and Walls in Balloon Construction. Except where openings for windows and doors occur, the studs are continuous from the foundation sill to the roof plate. The studs in any one wall are held at their proper spacing, 12 or 16 inches, just below each level of floor joists, by a 1 by 6-inch ledger board, which should be let into the studs on their inner sides so as to be flush and fit closely, and it should be securely nailed by at least two 10-penny nails to each stud. A ledger board acts as a sill for the joists. The joists should be notched to a depth of 1½ inches over the ledger board and should be securely nailed to the studs by the use of at least three 16-penny nails at each joint; this anchors the joists very effectively to the outside wall framing at

each floor level. The top ceiling joists should be similarly anchored and should be continuous clear across the building so as to hold together the tops of opposite walls. The continuity of the studs in the outside walls, however, is not sufficient to give these the lateral rigidity necessary for resistance to strong winds, not to mention hurricanes or earthquakes. To obtain this rigidity, the studs in each wall and story must be diagonally braced in the manner previously described for story construction.

Balloon Construction Versus Story Construction. In order to reduce carrying charges, lumber is moved nowadays with the greatest possible speed from sawmill to contractor, with the result that the timber goes into the frame long before it is adequately seasoned to prevent shrinkage. So it dries and shrinks after it is placed in the building, and, unless provision is made to counteract this shrinkage, it causes very serious cracking of exterior stucco and interior plaster, which often involves considerable injury to costly interior wall decorations. It is well known that, when timber dries, it shrinks longitudinally very much less than it does across the grain. For example, in a building consisting of two stories and basement, the total vertical shrinkage in the outside walls is much less, if the studs are continuous pieces as in balloon construction, than it is if the studs are interrupted at each floor level by joists and plates, because, in drying, green joists and plates will shrink very much. But such joist shrinkage can be counteracted easily without resorting to balloon construction, as will be explained presently. Theoretically, the chief merits of balloon construction are three in number: (1) Structural continuity between stories. (2) Minimum vertical shrinkage in the framing of the outside walls. (3) Convenient spaces for running plumbing pipes from story to story in the outside walls without injury to the frame.

If all the walls of a building were blank walls without openings for windows and doors, balloon construction could be framed very correctly and simply; undoubtedly there would be structural continuity between stories, and the vertical shrinkage occasioned by drying of the continuous studs would be much less than in story construction. But in practice there are some serious disadvantages in the use of balloon construction, as will now appear. Since all houses have numerous openings of various widths in different stories, and since these openings do not necessarily come vertically above one another, and since in many houses the walls of any one side frequently do not lie in the same vertical plane at all stories, frequently only a small fraction of the total number of studs in outside walls can be run through from concrete to rafters in practice, in fact in some designs too small a fraction to make the attempt worth while. Furthermore, in balloon construction it is more difficult effectively to truss the headers above openings, so that sags in the framing above the openings will not occur. Such sags will crack both stucco and interior plastering. Since the irregular location of the openings dictates the position of many of the studs, many extra studs must be introduced in balloon construction to provide at regular intervals for the lateral support of the floor joists. In balloon construction the size of studs in an upper story cannot be reduced without introducing a wall plate 4 inches deep at the break; also, along the walls in which the ledger board is placed, a separate header must be inserted between the floor joists near the inside face of the studs, to support the ends of the floor boards, when they are placed diagonally. Again, since the interior partitions in the several stories ordinarily do not come vertically above one another, it is not possible to apply balloon construction to them, so that, if ballon construction is used in the outside walls, there will be a differential settlement caused by the shrinkage of the joists supporting the interior partitions. This differential settlement will crack the interior plaster at the corners of rooms and in the walls that are perpendicular to the outside walls, and will cause great damage if expensive wall decoration is marred.

If the shrinkage in the outside wall at the joists could be eliminated from story construction, this type of framing would be preferable because of the simplicity of erection from the contractor's point of view and because the details of the framing in various stories can be arranged independently with greater ease. The elimination of this shrinkage can be accomplished in two ways,—(1) the studs of any one story may be run down alongside the floor joists of that story directly to the ceiling plate of the story below; (2) separate uprights of stud size may be adjacent and nailed to the joists wherever the joists rest on the plates of the outside walls or interior partitions, as shown by the sections in solid black in Fig. 8. This amounts to introducing a row of dwarf studs whose height is just equal to the depth of the floor joists. When the joists have shrunk, these dwarf studs will transmit the wall load from floor plate to ceiling plate, and thus prevent the shrinkage of the joists from cracking the stucco. The latter method is preferable to the former. The only remaining possible sources of considerable shrinkage in the frame are the ceiling and floor plates and where interior partitions of different stories do not lie in the same vertical plane, for then the dwarf studs are of no avail. If special care is exercised to get well seasoned plates, the shrinkage from this source should not be a serious matter. If the exterior architecture involves a half-timber design, an exposed timber belt course, interrupting the stucco at the level of the joists, will automatically allow for shrinkage in the plates. But in neither balloon nor story construction is there a simple way of overcoming the effects of shrinkage where interior partitions do not lie in the same vertical plane, excepting by the use of kiln-dried joists, because it is usually not economically feasible to run the studs of interior partitions down to a metal plate support at the bottom of the

joists. The equivalent of whatever continuity occurs in balloon construction in practice may easily be obtained in story construction by the use of timber sheathing diagonally laid at 45 degrees. Therefore, in the judgment of the writer, all factors being considered, construction by stories, with the modifications suggested here, is preferable to balloon construction. Erection by stories is used almost exclusively through the Pacific coast district.

Sheathing. Tests made by the writer on numerous wall panels at the Civil Engineering Laboratory of the University of California, and published in the *Bulletin of the Seismological Society of America,* December, 1925, under the title "Wall Bracing in Timber Frame Buildings," showed that when 1 by 8-inch sheathing was nailed solidly to the studs at an angle of 45 degrees with the horizontal, instead of horizontally, the resistance of the wall to earthquakes and hurricanes was increased about 40 per cent, provided the studs were braced also by diagonal stud braces, as shown in Fig. 8. Since such diagonal sheathing bonds the framework of the several stories and the underpinning to such an extent as to cause the entire building to act as a unit, it is strongly recommended wherever resistance to earthquakes or hurricanes must be considered. There should be two 8-penny nails in each 8-inch board at each stud, at each floor and ceiling plate, at each diagonal brace, and particularly at the bolted foundation sill, because diagonal sheathing, as already said, is very effective thus to anchor light timber frame buildings to their concrete foundations to prevent dislodging by a hurricane.

The tests mentioned also indicated that the use of 10-penny nails in the sheathing in place of 8-penny nails did not appreciably increase the resistance of the panels. Diagonal stud bracing should never be omitted simply because the sheathing is attached diagonally. In addition to stiffening the wall, the diagonal stud bracing that lies at right angles to the direction of the diagonal sheathing helps to prevent cracks in the stucco due to shrinkage of the sheathing. End joints in the diagonal sheathing, if required, should always be made on the studs, at points between but not at floor levels. If the end joints in the diagonal sheathing are made at the floor levels, a great opportunity to tie the frame together very securely is lost. At outside corners, the diagonal sheathing should be lapped so as to afford maximum nailing area in the boards for attachment to the end stud of the adjoining wall. Tenacious corner ties between walls are very essential for resistance to earthquakes and hurricanes. It does take a little more labor and material to nail sheathing diagonally than horizontally, but the structural advantages are well worth it. The tests mentioned here also showed than horizontally, but the structural advantages are pended on the diagonal wooden sheathing; the other half came from the diagonal stud bracing. Therefore, where resistance to earthquakes or hurricanes is needed, such wooden sheathing ordinarily should not be omitted, unless a very thick back-plastered Portland cement stucco is used in connection with special heavy reinforcement. Nor should any weaker substitute be used in place of the wooden sheathing, because not only will the rigidity of the wall be diminished, but, because of deterioration in time, such substitute may become a less desirable base for the stucco, which for permanence requires, among other features, a very substantial, immovable base.

There can be no doubt about the relative merits of diagonal and horizontal sheathing, so far as structural advantages are concerned. But their relative merits as a reliable base for the stucco should also be considered. Tests conducted under the auspices of the United States Bureau of Standards seem to indicate that cracks in stucco are likely to develop around window and door openings where green diagonal sheathing is used. This is true probably, because the studding is less able to offer lateral resistance to a 45-degree pull due to the shrinkage of the diagonal sheathing, than it is to withstand a vertical compression such as occurs when horizontal sheathing shrinks. The distortion of the frame occasioned by the shrinkage of diagonal sheathing, nailed on green, would naturally be evidenced by radial cracks at diagonally opposite corners of openings. Such cracking of the stucco can be avoided by using only well seasoned sheathing and many diagonal stud braces placed perpendicularly to the direction of the diagonal sheathing. The type of metal mesh reinforcement also plays a most important role in stucco crack prevention, but this will be discussed in a subsequent article. Even if the sheathing is horizontal, when green boards become seasoned, they will either shrink and pull the nails with them, or, if firmly held by the nails, they will split; in either case there is movement of the base under the stucco,—a very undesirable condition. The writer has seen much stucco remain in good condition over seasoned diagonal sheathing, but adequate seasoning of the sheathing is of paramount importance in preventing cracks in stucco and should always be insisted upon.

THE ARCHITECT AS CONSTRUCTOR

BY
JOHN TAYLOR BOYD, JR.

IS it desirable for an architect to undertake construction work? This is one very important question for the profession of architecture. It is not a new question, as Wilfred W. Beach points out, in his excellent articles on the subject, in THE ARCHITECTURAL FORUM for May, August and October, 1928,—but the constant evolution of the profession brings new factors into the situation, which necessitate considering it anew. One may agree in large part with Mr. Beach's views (although not subscribing to some of his strictures on the ways of contractors). Nevertheless, the question is one for each individual architect to decide for himself, according to his own talents and the circumstances of his practice. The type of competition he is likely to meet from contractors is also pertinent. The subject is most complicated, and there is more to it than both Mr. Beach and I can cover in a few articles. In reading Mr. Beach's words, one gets the impression that he has considered the matter having chiefly in view practice in smaller centers and in smaller buildings. My own views, on the other hand, come from experience in large construction operations in a large city; and in presenting these views, I believe it worth while to emphasize two very important factors. These are (1) the financial aspect, usually a governing factor in business affairs, and (2) the background of economic conditions, which although somewhat intangible, is likely to be, none the less, a determining influence, over a period of years.

The type of practice is all-important. Is it a specialized or a general practice? Since the war there has been a great increase in the tendency among architects toward specialization, and authorities hold that this tendency is in accord with economic trends. Is the practice located in a great city or in a smaller center? In what region of the United States is it? The answers to these questions must influence strongly the decision of the architect who branches out into construction.

One's personal experience colors one's views, and for this reason it may be well for me to describe my own contact with construction. After several years' experience in architectural offices of the conventional type, I served for about six years as one of four principal assistants in an architect's organization, engaged in a fairly large specialized practice, which, by letting sub-contracts direct, constructed a large part of its own designs to the amount of several million dollars' worth of buildings in its most active years. It was a very broad and a very detailed practical experience. It led me to conclude that there are some great advantages, not many disadvantages, and a number of great difficulties, in an architect's undertaking construction.

The Ethical Question. Before entering upon discussion of these, however, there is first to be considered the question of ethics. It is not necessary to quote authorities to uphold Mr. Beach in declaring that, even in the formal regulations of the A.I.A., there is nothing to forbid the practice, *provided* that the architect carries on the activity according to professional ideals, as distinct from commercial ideals. Everyone knows what this distinction is. More specifically, while the Institute will not permit the architect to become a "lump-sum" contractor, it allows him, as owner's representative, to place subcontracts on the basis of a fee for his services, which are professional. Under such conditions, the architect takes over an important part of the functions of the general contractor,—not all the general contractor's functions, however, when these relate to financial guarantee of costs or to financing the operation.

There is, nevertheless, a more intangible but no less important question involved in this question of ethics. "Will not the responsibility of construction be detrimental to art?" asks the doubter. It should not be detrimental to art any more than the existing conventional method is, as seen in a large part of professional practice. Too often, art, to say nothing of high standards of design, which do not quite reach the level of art, is secondary to business. By "business," I mean the usual activity of making contracts, of getting commissions, and a variety of promotional activities, from studying real estate trends, rentals, site values, locations, mortgage conditions, acquisition of a moneyed following, and the forming of syndicates, to the putting through of deals, and the scheming out of ways of financing building operations. This, of course, is a rather damaging answer to the accusation, I fear. It will shock many people on both sides. It will inflame the old school practitioner whose practice lies in the fields of public, domestic, ecclesiastical and institutional architecture where, ordinarily, finance does not affect the architect, and it will disappoint my good friend, C. Stanley Taylor, who rather advocates this business activity. Mr. Taylor would reply that business should not necessarily injure art. Unfortunately, it very often does, if the opinions of a number of observers of architectural practice in New York have any value. So I fear that this important side of the question must be left undetermined for the present, except for a few pertinent observations. The art side is always paramount in architecture, otherwise by definition architecture disappears. If it neglects art, the profession of architecture has no valid excuse for existence. Let us, furthermore, do away with "bunk" and sentimentality. We must recognize that the constant preoccupation with business matters, which is often necessary to provide a steady volume of new business to keep going many large,—and

many small,—architectural organizations, has the effect of crowding out art, as well as of developing a view point which is antagonistic to professional progress. The pressure on the architect tends to make him view architecture through the eyes of the real estate broker, promoter, or speculator, whose understanding of business and economics, in turn, may be one-sided,—that of a trader and salesman, not that of the more analytical "constructive" producer who is coming more and more to guide the modern American economic organization. When he holds this point of view, the architect tends to become an opportunist. On the other hand, construction is more closely allied to art than is business, and it reëstablishes the architect in the old role of master builder. In any case, it is well to bear in mind the observation which Julian Clarence Levy makes in these frequent discussions of the ills that beset the profession: "Most of the troubles which arise in professional practice are due to the fact that architecture is at once an art, a profession and a business." Perhaps the only conclusion to be drawn as to this phase of the matter is that American architecture must reach a higher level of art and design if it is to maintain its high standing.

Duplication of Function. To come to the heart of the question of architect versus general contractor, it seems clear that, in practice, there exists a real overlapping or duplication of function as between the two. The pressure of modern economy is to do away with this expensive waste effort. My direct observation of the methods of several large general contractors, and my knowledge of New York building customs, convince me that this duplication is serious. The general contractor claims (1) that he plays a necessary role in a building operation because he possesses a concentrated, exact knowledge of structural details likely to exceed that of the architect; (2) that he handles the huge mass of details of administration to best advantage; and (3) that he provides the necessary financing of the actual erection. In theory, he alone can best carry out these three functions, and hence he is entitled to an undisputed place in the economic organization. Let us see how this claim works out in practice.

The Organizations Compared. I have observed that the organization of an architect who has a large specialized practice in one or two types of buildings is likely to be more expert in its construction details than the organization of a large general contractor who builds all kinds of structures and who is rarely so specialized. I know that this is contrary to the impression spread by an active propaganda, which pictures the architect as "impractical." Actually there are good reasons for my belief. The old style builder, the man who really knows construction as only years of driving nails and laying bricks "on the job" can teach it, the true craftsman builder, the man who can really give to the most practical architect and draftsman points,—this old time character is passing from the great general contractors' office organizations. He is being replaced by executives and office workers of a different type; by men who often know less about construction details than do the men in the architects' organizations. Some of these contractors' men are called engineers, but actually their chief claim to this title is a degree from a professional school of engineering. They have hardly the practical experience which entitles them to be ranked with the old time builder. Even their engineering education has much less specific bearing on building than has the corresponding training in an architectural school. After graduation, these contractors' office men may get a few years' experience in office administration, in work in a field office on a large construction project,—in other words, work of a general character on a variety of building. This can hardly approach the specific, practical value of the experience gained by the graduate of an architectural school in an architect's office, who perfects his structural knowledge in years of planning, detailing, correcting shop drawings, of one type of building. Even more, others in the great contracting companies may lack even the advantages of a vague engineering education. One finds accountants, lawyers, traders, contact men, salesmen, good fellows who have none too practical a knowledge of construction details. Experience and practice teach them much, no doubt, but they often know less than a good architect's man, and very much less than an old time builder, particularly in the vital matter of costs. No one can know costs quite so well as the craftsman-foreman, who has had years of daily experience as a workman, in handling workmen, solving erection problems, and in purchasing materials. After all, the best man in construction work is the man who can "buy the job." This fact should never be lost sight of. My experience is that it is rarer than good administration.

The old time builder no longer dominates many an important construction company. More and more he tends to gather in the ranks of the subcontractors. There he is doubtless more effective, because his concentration on construction tends to unfit him for complicated administrative duties. Of course, there are many fine contracting companies where the simpler organization, comprised of experienced building men, still exists. The chances of an architect's competing successfully with them lies in the advantage of detailed experience gained in a specialized practice. The less successful organizations have many of the weak points listed by Mr. Beach.

The effect of this diminishing expertness in structural matters in a contractor's organization is marked. It piles up a clumsy administration with an expensive salary list, which makes the general contractor a none too efficient intermediary between the architect's office and the subcontractors'. The general contractor's office often seeks to shift its responsibilities to the architect's men. It particularly fails to coöperate with the architect's office in checking. Often this is due to no lack of good will, but rather to insufficient knowledge of building construction. I have observed

that plumbing, heating and other mechanical details are frequently mismanaged by general contractors, so much so that many architectural offices of the conventional type let these subcontracts direct in order to save trouble. Therefore, the direct method of dealing with the subcontractor does not add to the architect's difficulties as much as might be supposed. I well recall the sensation of positive relief in my first experience of the direct method. It was as if a veil had been suddenly lifted between myself and the subcontractor,—the man who actually put up the building.

As regards the second function of the general contractor, that of undertaking necessary administrative functions, it needs little further argument to show that if the contractor's men are less expert than either the architect's office or the "subs," his claim to be of service is less valid. The contractor's man is less helpful than would be a good building man in an architect's organization, rendered more expert by a specialized practice and by dealing constantly with designers. In certain classes of buildings of a complicated character, having a mass of special interior details, such as a country house or a hotel, the architect's office must perform in any case a formidable amount of superintendence, and but little added effort is necessary in order to make this superintendence include erection as well as inspection. Particularly unsatisfactory, in most cases, is the employment of a clerk of the works. Having myself performed that function many years ago, I can testify that it is often a fifth wheel,—a bird without wings. When an architect goes so far in adding expense, why not go the whole way and make the clerk of the works a real construction man?

Financing. The third function of the general contractor,—namely, financing,—is difficult to appraise because it varies so extensively in practice. I suppose that most architects have known cases where the general contractor contrived to shift this burden to the subs as much as possible. He did this either by inducing them to accept notes, or else by delaying payment on requisitions after the architect issued his certificates. In New York, among builders of the more speculative "shoe string" type, this practice is being condemned by organizations of subcontractors and material men. It is claimed that the subcontractor is the real speculator in the deal, without having the compensating advantage of a voice in the business. This phase, of course, opens up another and very complicated side of the situation,—that of finance. As everyone knows, the financial side of contracting is always becoming more important. It presents perhaps the greatest obstacle to an architect's engaging in construction. In many cases, the builder's control of capital may be his greatest weapon in competition. The offer of a large subscription to the capital stock in a great proposed new building, or willingness to take a second mortgage, may be worth more to an owner than would be a saving in cost per cubic foot on a straight construction contract. What the owner loses on erection cost, he more than makes up on lower premiums for capital. In these cases the contractor becomes a speculator or investor in the building.

The architect can hardly go as far as this, although, as mentioned previously, he has, in many cases, already gone pretty far in promoting and in attracting a moneyed following. Thus, commissions are sometimes awarded to an architect mainly because he can interest his following in subscribing part of the money required by the syndicate undertaking a building project. In addition, the architect himself may accept part of his fee in preferred stock, second preferred, or common stock. The speculative method of financing which, to greater or less degree, underlies most real estate, leads naturally to such practices, and the individual is obliged to cope with them as best he may, according to the particular circumstances of his personal situation.

This summary of the duplication of functions between architect and general contractor suggests that much duplication exists in certain instances in the three chief functions of structural expertness, administration and financing, which the general contractor undertakes to perform. It indicates that the architect, particularly the architect of specialized practice,—and the trend of the day seems clearly to be towards "specializing,"—has good reason to believe that he is better fitted in many ways to undertake these functions than the contractor is. The chief obstacle is the financial power which many contractors wield in being able to supply capital for an undertaking.

The Economic Element. Nor should one overlook the basic economic element in the question. The economic and industrial development of the United States proceeds at an amazing pace, with bewildering changes. Its goals seem to be specialization, integration, volume production, efficiency. These changes bring gigantic success or overwhelming disaster to any industry, according to its ability to adjust itself to economic changes. The automobile industry and the coal industry are cases in point. It may not be enough to wait until the changes arrive,—it is better to anticipate them, if possible. All this may sound vague, but I have felt for some years that the architectural profession would do well, for its own security, to recognize that point of view. Viewed purely as a profession, architecture can scarcely avoid being affected by the profound movements in American industry; and, to the extent that it is a business, it should be still more prepared for changes in business conditions. More specifically, the profession should, I suggest, consider these possibilities:

(1) Large scale operation, not merely "big" single buildings, but construction by blocks, areas, districts. How otherwise can the modern city develop efficiently?

(2) Elimination of speculative methods, which involve small-scale operation and high costs.

(3) Low costs, to which sounder financial methods

will contribute most, as financing is a large factor.

(4) Prevention of inflation of site values, which cuts down the market for buildings.

All these factors are bound up, one with the other. Strange as they sound to some ears, it will be observed that they express nothing but the accepted doctrines of Big Business. Is it not reasonable to think that they will eventually have an effect on real estate and building?

The Organization Necessary. Turning from these general considerations, the matter of next importance is the type of organization needed by an architect who embarks in construction work. The architect should not copy the expensive, none too efficient organizations found in some of the largest construction companies. His office construction force should be modeled more after the old builders' administrative nucleus; two or three executives who knew construction, with the aid of a bookkeeper and stenographer or two, renting an office of two or three small rooms, handled easily several large projects at once. The architect would do well to add to his office force a designer of structural steel and concrete. This man should spend most of his time in the drafting room, working side by side with the designers and draftsmen, where he can witness a building conceived, born and brought up, lending invaluable assistance to the process. Such a man may be more valuable than one working in a contractor's or consulting engineer's office. He need assist the builders only occasionally, with a little advice, or by undertaking occasional superintendence of complicated foundations or structural details, although generally the builders can administer these. One builder-executive is usually enough. His function is to let contracts, with the occasional assistance of the drafting room in checking and in estimating. Estimating quantities of materials is not difficult. The executive is helped by the specification writer in drawing contracts. With an "outside" construction superintendent, this executive administers the construction work. He needs comparatively little assistance from the accounting department.

As to the stumbling block of mechanical installations, that is not serious in the hands of experienced building men who are constantly engaged in construction of the same one or two types of buildings. As noted, it is admittedly a serious defect in general contractors' organizations. A man who has erected the same type of building 20 times has little to learn about plumbing, electrical and low-pressure steam heating installations from an expert in a general contractor's organization who may also have built 20 buildings, but each of a different kind. Actually, the average building has little that can be called real, professional engineering in it. Sometimes I think we architects fool ourselves by using the word "engineering" in connection with buildings. What is really involved is *purchasing*. The rest is chiefly a draftsman's work. On buildings, a man may have an engineering education, but that does not mean that he acts in a true engineering capacity, as he would in erecting a bridge or a factory. In the average building, the construction man may need, at most, a few hundred dollars' worth of advice on sizes and specifications of mains in piping, details of valving, etc., around tanks, heaters and boilers, as well as some electrical details. This information is supplied also to the drafting room and to the specification writer; and, since costs are paramount, this information may be best obtained by selecting some keen young man in a subcontractor's force or a supply house, dealing directly with him as an independent expert.

The architect's field organization should be likewise simple. Each project has a construction superintendent who reports to the "outside" construction superintendent, and who has the usual clerical and other aid, depending on the size of the undertaking.

In all this discussion of organization, close personal contact and coöperation are essential to efficiency. In any operation so complicated as that of producing a building, where so many different types of men are engaged, there is no substitute for working in the same organization. No talk of "collaboration" can obscure this fact. I can give a striking illustration of the value of this type of organization, in dollars and cents, and its comparison with a contractor's organization. The story would be still better if I could give the names. A client had plans prepared for a group of buildings estimated to cost well over a million dollars to construct. A building company of national reputation was estimating the project on a cost-plus-fee basis. The architect, who had himself undertaken construction work on a large scale, was coöperating with builder and client in the familiar process of "getting the costs down." The architect called me in on the estimates. "See here," he explained, "they have allowed some $53,000 for office overhead. What do you think of that?" This allowance was in addition to the cost of the actual erection, but not including field office. We made a rapid calculation and figured that $15,000 was an outside figure to allow for the work, as based on a similar operation the architect himself was undertaking. This episode is significant in several respects. In the first place, the excess allowance for overhead in the general contractor's estimate would have paid the architect's cost of doing this work, and a fat fee besides. Secondly, when I related this story in a recent conference with two executives of another large contracting firm, they said that the contractor's estimate was "about right," and that their own cost would have been the same. Third, the architect could have erected that building at a lower cost per cubic foot than the general contractor, as well as making a saving to the client on overhead and fee. The client knew this to be true, but nevertheless he employed the general contractor. The reason was that the contractor put capital into the project to the extent of becoming the principal owner. The client's chief interest was in selling the land. The buildings did not sell or rent very well,

and expectation of profit was apparently not fully realized. This story presents a very complete picture of the role of architect in construction work.

It is easy to understand that it is an important asset for an architect to undertake construction successfully. It strengthens his organization in a remarkable way, perfects it to an extraordinary degree because of the constant direct contact with builders, and, of course, enables it to give,—or at least to appear to give,—to the client just the service he ought to get. To the public it makes architectural services seem real, as they often do not in conventional practice. This makes for better fees.

It should be apparent that success in construction work depends not only on the architect's forming a strong, permanent organization, but also on supplying that organization with a sufficiently steady volume of work. Otherwise, his organization fails of its purpose, which is to offer a more experienced, more closely knit and more accurate service in competition than that of the general contractor. This purpose is defeated if the organization is not kept busy and is reduced or disbanded, to be again recruited when commissions come in. Such an organization is difficult to obtain and difficult to perfect. It cannot be improvised by constant hiring and firing, as is frequently supposed. For one thing, the construction men should be of a finer, more aggressive type than is the average "practical" or "construction" man in the usual type of office, who is too often a hack, a typical inspector, more plodding than energetic.

There is an additional reason for ensuring steady volume of work. In addition to his formal organization, the architect, to succeed, must acquire a "following" in the local construction world. The subcontractors, supply houses, material men, truckmen, labor leaders, mortgage interests,—all must learn to realize that the architect's organization is a strong factor in the construction field, whose good will is worth cultivating. Without this following the architect will suffer in many ways. In times of a shortage of labor or materials, for instance, the architect's organization will not obtain the needed service. Also, his sources of information will dry up, and he will lose control of costs. Such an organization quickly goes down hill without the architect's realizing what is happening. Like the man whose wife is unfaithful, the architect may be the last to learn about what has happened in his own household.

As suggested in the beginning of this article, the architect's own talent is an important factor. Architecture is an art, a profession and a business. It is rare when an architect omits successfully even two of these spheres in his work, to say nothing of all three. Even in the field of business,—which is always expanding in architecture under the pressure of modern technical and industrial complexity,—even here the architect may be a better salesman than executive. Or in construction he may be a better executive than constructor. Hence the architect's personal relation toward contracting construction may vary. Perhaps sound, well rounded organization is the best general answer to such individual matters. The chief of the construction department should have a major relationship to the architect, if not in the form of a partnership, at least in almost as important a role, one that includes possibly the ability to promote new business or to assist in obtaining new business, as well as to engage in actual erection. The chief in charge of construction should be a most capable, forceful man, of true partnership material. The architect cannot afford to have less, neither can the construction head afford to *be* less.

In conclusion, it seems probable that the question of whether the architectural profession as a body will undertake construction must be decided by the pressure of circumstances, mostly economic, rather than by any theory. On this question, a sound body of opinion holds that the architect has a definite professional role, essential to the proper functioning of the building industry, and that he will do best to keep to that role, whatever be the good results obtained by occasional individuals' competing with contractors. As proof of their contention, they cite the statistics showing that architects control a vast majority of building projects of any size. They also point to the historical evolution of the modern American architect out of the contractor, and they look upon any return to earlier conditions as a step backwards. This conservative view is sound, and it puts the burden of proof on the pioneers. They have on their side the truth that there is much duplication between the architect and general contractor today, and that the client objects to paying two people to do the same thing. At present, in the division of fees, the architect is likely to get the short end, as illustrated by the fact that, although the architect is today in charge of construction work, he barely gets a living wage in return for his huge technical and business responsibility. Unless he speculates he has almost no chance for those "killings" sometimes possible in business. Furthermore, the business complexity is growing. It seems to have arrested, if not actually pushed down, that splendid artistic achievement in architectural standards, which is the very life blood of the profession. The promoter-architect or real estate architect is coming more noticeably to the fore in recent years. Is he any more of an architect than is the builder-architect? Again events must decide. One may suggest that if American large-scale methods ever do spread into the building world, we shall see startling changes in the practice of architecture. Among them may be a drastic elimination of competing organizations. There may also occur, in the attendant financial reorganization, a condition of less real estate and more technology in architecture. The designer may be more closely allied with the carrying out of his designs than is now generally the case.

THE RELIGHTING OF THE FIRST CHURCH OF CHRIST, SCIENTIST, BOSTON

BY
R. B. BROWN, JR., and KARL ANTON PIEZ

FOR the last ten years the officials of the First Church of Christ, Scientist in Boston had been considering proposals for relighting the "Mother Church" in a more adequate manner. A knotty problem was presented, involving modification of existing equipment, installation of new luminaires according to good lighting principles and in harmony with the architectural design, and in addition a novel application of various systems used in modern illuminating engineering practice. The solution of this special problem, through the coöperation of the church authorities, the engineers, the manufacturers of the equipment, and the electrical contractor, has many fascinating and instructive aspects.

The "Mother Church" is a conventicle type of building, in which attention is generally directed to the reader's platform in front of the congregation. However, interest may be focused upon any part of the auditorium, as various members arise to address the congregation, and adequate illumination, though brightest on the platform, is needed everywhere else in the huge auditorium. The church is of Italian Renaissance design, with the great central dome flanked by two smaller semi-domes. The building itself has a frontage of 236 feet, is 144 feet deep, and the extreme height is 224 feet,—3 feet higher than the Bunker Hill Monument. The first story is of New Hampshire granite and Tennessee marble, above which limestone has been used. The dome, semi-domes, and cupola are of cool gray, semi-glazed terra cotta. Limestone and marble are used as the interior materials, with very elaborate plaster ornamentation. Carved and colored marble also forms part of the wall decoration. The woodwork is mahogany. The auditorium has splendid proportions, and seats five thousand persons.

The original system of lighting was installed in 1906. At that time the main auditorium was lighted by eight massive bronze chandeliers, each having 73 exposed lamps. In the semi-domes, bare lamps on 8-inch centers were concealed above the cornices, and the ceiling pieces under the balconies and elsewhere contained clusters of three or more bare lamps. On the walls about the auditorium were torcheres equipped with many lamps, usually in pyramidal forms.

Since this initial installation was made, every advance in illuminating engineering naturally emphasized the need of an improved lighting system. The fixtures containing the exposed lamps were obviously out of place, and the lamps themselves, being replaced through the years by more and more efficient units, became sources of harsh glare. Proposals for a design of a new lighting system for the main auditorium had long been considered, and many specialists had been consulted on the problem. The proposals were various, such as to secure:

1. An improved design of the eight existing chandeliers.
2. Indirect lighting from eight fixtures.
3. Indirect lighting from coves.
4. Indirect lighting from one fixture.
5. Floodlighting through windows.
6. Floodlighting through new false skylights.

In each of these plans the semi-domes were to be cove-lighted as formerly, and all supplementary luminaries were to be retained around the auditorium, after having been so changed as to provide comfortable light. The real problem was to light the central area of 8,800 square feet with a dome ceiling 108 feet high, 90 feet in diameter, and starting 75 feet from the floor.

It was decided that a scheme of floodlighting was the ultimate solution, preferably a scheme which would give a desirable cove lighting effect. The plan adopted consists of floodlighting the central dome itself through the oculus. The light is directed from just below the skylight glass down upon the walls of the plaster dome, and from there indirectly to the floor of the auditorium. The advantages of this scheme are that:

No changes were necessary in the architecture.

A most desirable effect is attained.

The lighting equipment is entirely concealed, yet readily accessible.

Standard floodlighting equipment is used, and both the initial and operating costs were reasonable.

Booms Used in Refinishing Interior

MAIN AUDITORIUM BEFORE RELIGHTING

EFFECT PRODUCED BY NEW LIGHTING ARRANGEMENT

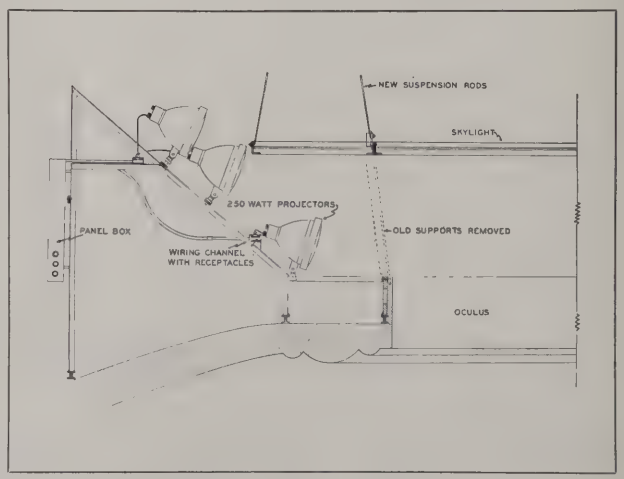
VIEW OF CENTRAL DOME BEFORE RELIGHTING

CENTRAL DOME RELIGHTED

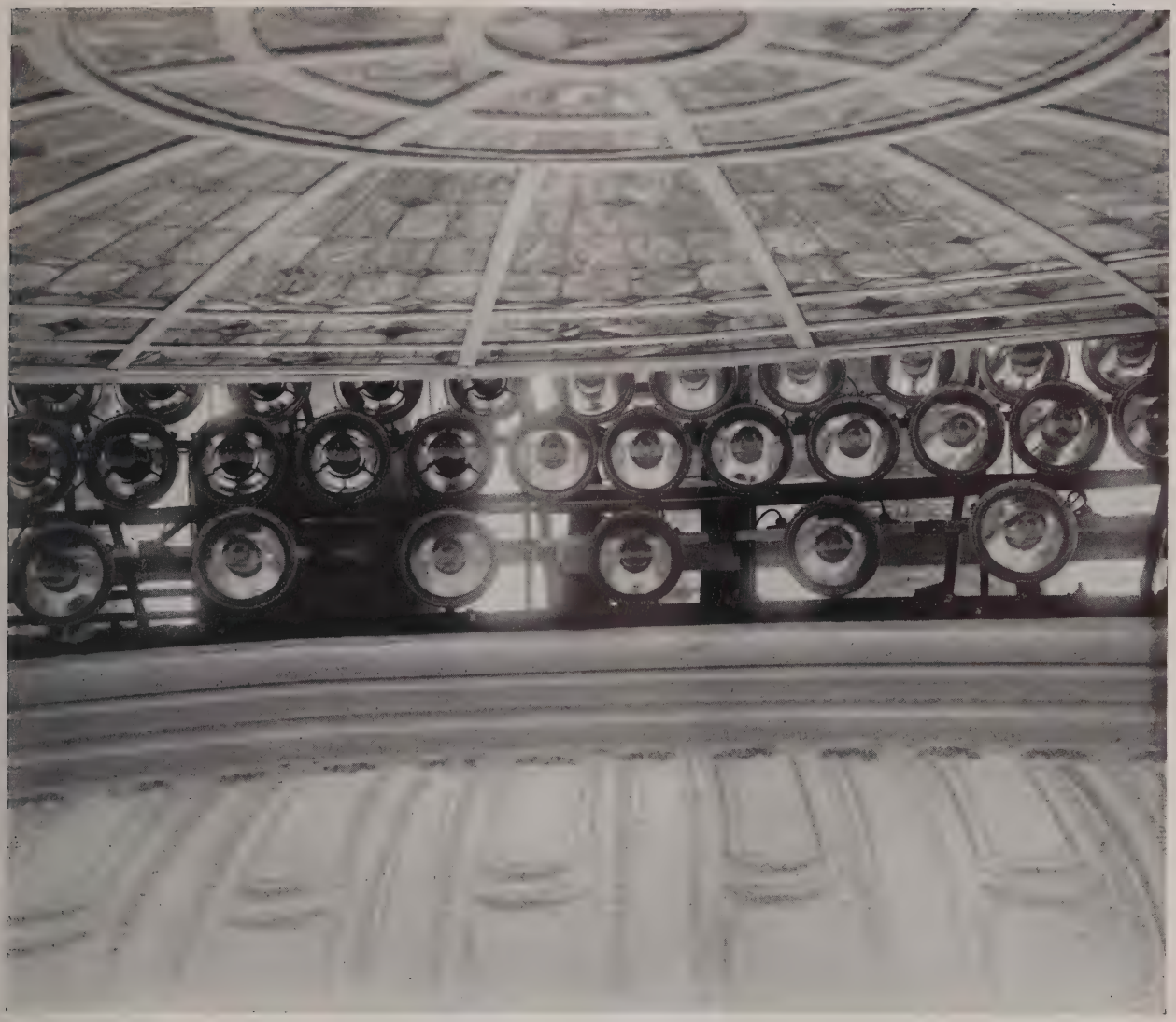
Projectors Mounted Above the Oculus for Lighting the Dome

In deciding upon the actual layout in terms of wattage, the reflecting factor of the plaster dome under reasonably clean conditions was found to be 48 per cent. Considering the area to be 10,000 square feet, and thus giving an adequate factor of safety, the designers arrived at the figure of 4 watts per square foot or a total of 40 kilowatts necessary in order to provide the auditorium with sufficient illumination. To insure evenness in the spread of light over the entire dome, it was decided to use small units, and 250-watt projectors, having a beam spread of 12 degrees with lamp at focus, were selected. The comparatively large number of small units gave the advantage of directing the light from at least five projectors on any one point in the dome. The projectors were mounted on a special steel circular framework in three tiers. The skylight glass above the oculus itself was widened 30 inches to hide the projectors from the line of sight. It was found desirable to transmit direct light downward through the glass for the sake of appearance. Twelve 500-watt floodlights give enough brightness to the glass.

For the two semi-domes, a new and efficient cove-lighting installation was made, using 50- and 100-watt inside frosted lamps alternated, located in groups. The throw of the 50-watt and 100-watt in-

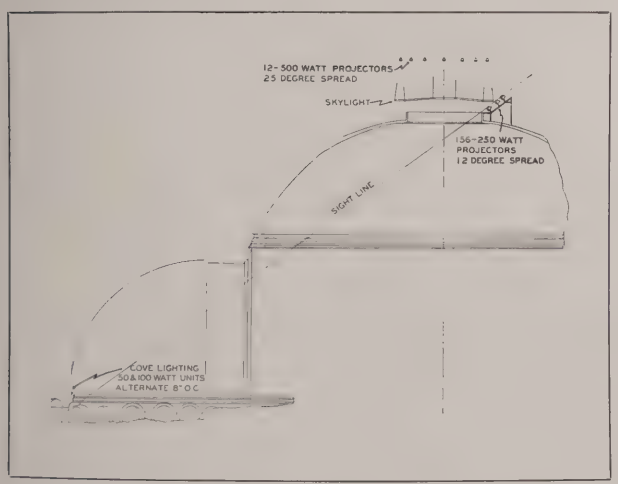


Method of Mounting Projectors



Projectors Installed for Lighting Through the Oculus of the Dome

side frosted lamps was alternated in the groups. The throw of the 50-watt lamps is straight up, and that of the 100-watt lamps is tilted slightly forward. Silvered glass reflectors were used on the old outlets. On the pedestals lighting the reader's platform and on the torchere brackets around the walls of the auditorium, new tops were installed in order to overcome glare. In addition, various other types of luminaires were designed and made for the spaces under the balcony, in the colonnades at the rear of the side balconies, on the rear auditorium wall, and on various stair walls. Totally indirect lighting from suspended fixtures was also adopted for the Sunday School room.

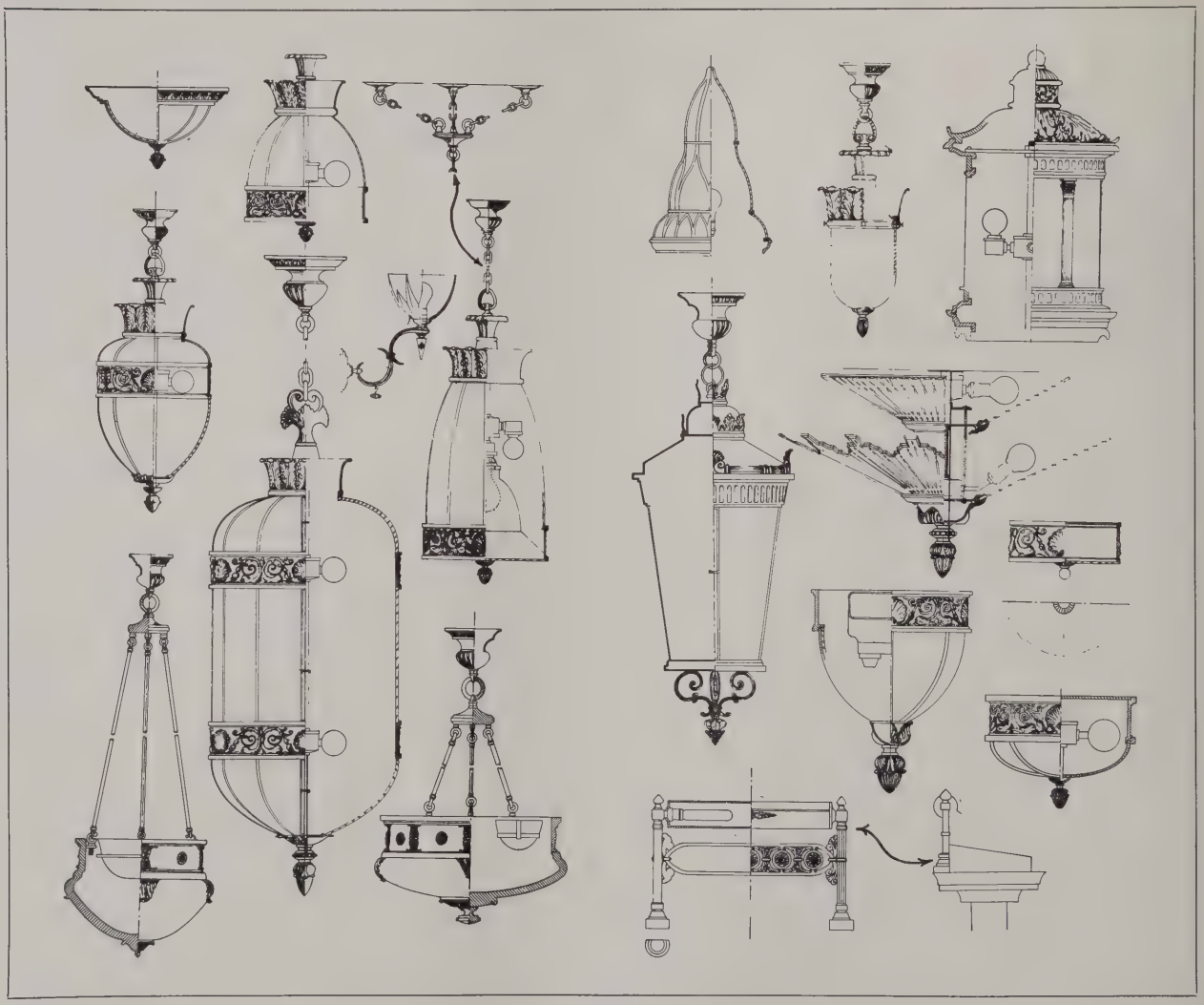


Lighting Scheme, Main Auditorium

The result of the main auditorium lighting is an even illumination on the main floor of the church at a level of 7-foot candles, which is unusually high for church lighting at present. This may be cut down one-quarter or one-half, since the projectors are on three circuits. The cove lighting in the dome and the semi-domes may be switched one-third, two-thirds, and full intensity. The flexible lighting scheme which has been adopted is entirely in keeping with the type of service in the church. All the luminaires are of appropriate design, and the indirect lighting effects reveal the full beauty of the entire interior.

PLATFORM LAMPS, OLD AND NEW

TORCH BRACKETS, OLD AND NEW



DETAILS OF THE VARIOUS NEW LIGHTING FIXTURES
FIRST CHURCH OF CHRIST, SCIENTIST, BOSTON

THE CLIENT, THE ARCHITECT AND THE CONTRACTOR

PART I. THE CLIENT

BY
CLINTON H. BLAKE

FOR many years I have been called upon to advise alike the owner, the architect and the contractor. As a result, I have had rather unusual opportunities for becoming familiar with their attitudes, the one to the other, and with their conceptions of their respective rights, liabilities and duties. A very large percentage of the misunderstandings and difficulties which arise between them is due, not to any conscious desire on the part of anyone to be unfair, but rather to certain fundamental misconceptions of the obligations which each of them owes to the others. If these misconceptions can be removed, and if there can be brought home to these three chief participants in the building operation a true understanding of their respective rights and liabilities, the benefit to each of them will be considerable. My purpose here is to point out, so far as I may, some of the major points of misunderstanding and misconception.

Year by year the architect and owner, broadly speaking, are approaching, I believe, a more thorough understanding and accord. Year by year, also, there has been a corresponding betterment in the understanding of the contractor and in the relations existing between him and the architect and owner. While there are many points of irritation and misunderstanding, in a very large percentage of cases the difference will be found, on analysis, to have resulted from one of a comparatively few causes. In the main, the difficulty heretofore has been that the architect has to a certain extent isolated himself in his professional atmosphere, that the owner has made too little effort on the other hand to understand the professional attitude and point of view of the architect, and that the contractor has failed to realize, as generally as he should, the potentialities for good to him in a closer and more whole-hearted coöperation between his organization, the architect, and the owner. It is not my purpose here to engage in a technical legal discussion, but rather to point out in general the points of misconception and the causes of differences between these several parties. A fuller understanding on their parts of their legal obligations and rights is naturally desirable. They should be able to attain this, however, without the confusing admixture of legal red tape and discussion. Where necessary, in the future as in the past, they can secure legal advice and unload their worries upon their attorneys. The really important thing is that they should so clarify their understandings of the respective positions which they hold in the building operation and of their rights and liabilities in general, that controversies between them will *not* develop to a point were legal action will be involved.

1. The Point of View of the Owner. The ordinary client's conception of the ordinary architect is at once flattering and disparaging. On the one hand, he attributes to the architect abilities in discounting the future and in securing perfect results far beyond the point of reason. On the other hand, in many cases he believes the architect to be an eccentric, artistic soul, possessed of temperament and ability, but wholly lacking in business understanding and often even in common sense. This latter conception is giving way rapidly, as a result of the increased understanding among architects of the business and practical elements involved in the practice of their profession. It has been and is responsible, however, in repeated cases, for the failure of an owner to employ an architect, where he might otherwise do so, and for many of the instances where owners undertake to plan and erect their own houses, with the aid of a builder and without securing any trained architectural advice. Such a proceeding is not in the interests of either the owner, the architect or the contractor. The architect is a vital factor in any properly conceived and carried out building operation. His participation in such an operation benefits the owner and the contractor alike. Not only does it result obviously in the securing of a better and more valuable result, but it contributes to the situation, in the person of the architect, the balance wheel which goes far to remove needless causes of irritation between the owner and the builder and to insure to each of them fair treatment.

The client's conception of the architect as an artistic soul, largely lacking in practical understanding and common sense, is, of course, wholly unjustified. I have had occasion elsewhere to express and to reiterate my firm opinion that artistic and business ability are not incompatible. In repeated instances we find architects possessed of the highest artistic training and ability who are, at the same time, possessed of sound business sense and judgment. The architect of today must face business practicalities and conditions to a far greater extent than ever before. The complexities of modern life and of modern business structures, the adoption of building laws and zoning ordinances, the complications involved in labor conditions and in the material market, all make it essential than any successful architectural organization include business as well as artistic and technical capabilities. As architects have more and more become aware of this fact and recognized the need of business training and ability in their profession, so they have correspondingly broken down to a large extent the old misconception of the owner and brought to him a realization of the fact that the modern architect may be quite capable of exercising business practicality and understanding in his handling of the client's problems.

The flattering misconception of the architect by the owner is, curiously enough, more destructive of ac-

cord between them than the uncomplimentary conception which we have just discussed. The client in many cases holds, firmly fixed, the idea and opinion that the architect, as a result of his technical training, is necessarily omnipotent in many ways. He believes that the architect can tell him the exact cost of a proposed building; that he can foresee to a nicety the cost of labor and material; that he can foretell exactly how the completed whole will appear; and, above all, that he can and will so oversee the work as to provide a 100 per cent complete and satisfactory structure. Such a conception, while flattering to the architect, is full of dynamite. He will be far better off, in proportion as he can bring the client to understand that he cannot foretell accurately the costs of labor and materials; that he cannot guarantee a perfect building, either artistically or mechanically; and that he can but do his best, with the special training which he has had and with due diligence, to approximate the ideal which the owner has in mind.

The average owner, in his attitude toward the building operation, falls into one of two errors,—either he feels that he is competent and called upon to tell the architect how things should be done, or else he throws all responsibility upon the shoulders of the architect and expects the latter to accomplish a splendid result, without real coöperation from him. If the owner must follow one of these courses, instead of the common sense middle road, it is preferable, certainly, that he should leave matters in the hands of the architect, rather than endeavor unduly to dictate the action to be taken. I know of nothing more irritating or demoralizing to the friendly relations of the parties and the good of the project than a client who is forever fussing over details, changing his mind, issuing new instructions, and acting generally as if he were himself quite competent to act as architect or contractor, or both. In handling a client of this kind, the architect is called upon to use tact and discretion, and above all to have a sense of humor. He must use tact in order that he may not unduly irritate the client. If the client be given his head to some extent and allowed to talk, he will usually in the end meet the recommendations of the architect, if the latter does not endeavor to force them upon him too strenuously in the first instance. The use of discretion by the architect in this connection is, however, necessary. He cannot safely ignore the client's requests for changes. He must be careful to keep the record quite clear and be in a position at any time to show that where the work has been continued in accordance with his recommendations and after contrary suggestions by the client, this has been done only after the latter has acquiesced and finally approved.

The client has commonly a misconception, also, of the professional status and obligations of the architect. Very nearly without exception, the client will hold the point of view that the architect's sole obligation is to him; that the architect is employed by him and must act solely as his representative and adviser, and that he owes no obligations to anyone else in connection with the building operation. It is perhaps a natural thing that the layman should have this misconception of the architect's duties and responsibilities. It results probably from the fact that he regards the architect exactly as he would a lawyer or a physician,—as one whose sole obligation, aside from engaging in ethical and honest practice, is to his client. The fact is, of course, that the architect, while his primary obligation is to the client, has nevertheless a very real and important obligation to the contractor. The client loses sight entirely, ordinarily, of the quasi judicial functions which the architect, in his supervising capacity especially, is called upon to perform. He fails to realize, until he is educated so to do, that the architect is called upon time and again to make, in effect, a judicial and fair determination in questions involving interpretations of the plans and specifications, the character of the work done, the issuing of certificates and the like. The architect should not and cannot safely or properly be the advocate of the client alone. Where the contractor is in the right, the honest architect will support him.

When all is said and done, 90 per cent of the misunderstandings between owner and architect have to do with changes in plans, with supervision, or with questions of cost. In part, these misunderstandings result from a misconception on the part of the architect with respect to his proper rights and functions in these matters, and in part from a misconception with respect thereto on the part of the client. I shall have occasion to discuss in a succeeding paper the ways in which the architect errs in this connection. For the present, we are interested in the attitude of the client. With respect to changes, the layman has very generally the idea that his architect, without any increase in his fee, is supposed to make any and all changes in the studies and drawings which the client may from time to time desire; that it is part of his professional duty to make, within reason, any number of preliminary studies and to continue turning out studies and drawings and specifications, until he has produced those which meet fully the requirements of the client.

Given a client who knows his own mind with reasonable definiteness and who is himself reasonable, the architect will not have so much difficulty on this point. Given the ordinary client, however, who starts out with a more or less indefinite idea and insists thereafter, alone or in collaboration with his wife, on successive modifications of it, and the architect is presented with a real problem. He must satisfy the client or break with him. At the same time he must, in justice to himself, either receive additional compensation for his extra services in making the changes or so limit the changes made that they will not seriously reduce his profit. The owner is gradually being educated to an understanding of this situation by the employment of contracts between owner and architect and by the slow but

general improvement in a better understanding by the layman of the architect's status and methods. The layman ordinarily has no conception of what it costs the architect to produce studies and working drawings, not to mention details. He may be somewhat impressed by detailed drawings, but he is ignorant, as a rule, of the sums which must be expended to produce the finished drawings which are placed before him for his approval. To him they are merely mechanical drawings, which might be produced readily in a few hours' time. He has little conception of the amount of time which has gone into their production, of the costs of draftsmen and office overhead, and of the amount of time which the architect or his assistants in design and construction have given to the study of the particular problem in hand. It is natural that the client should have this point of view. Every professional man labors under the same handicap. Where a lawyer draws a contract, the client, unless he has been compelled to attend conferences during the time that it has been in preparation, sees only the finished work and does not realize the hours of research and the time given to preliminary drafts and changes which are responsible for the final document. The client of the architect has the same point of view. This again is a matter of education. Gradually the client will secure a better understanding of what it costs to produce his work and to maintain and operate a modern architectural office and organization.

The second chief point of misconception by the client relates to supervision. It is not at all an extreme statement to say that the client ordinarily holds the point of view that the architect, by reason of his training, should be and is able so to supervise the work as to insure substantially a perfect result. He has the point of view that the architect's fee covers whatever service is necessary in this connection. He has little, if any, conception of the wide difference between ordinary architectural supervision and the supervision of a resident superintendent or clerk of the works. Here again the misconception of the client is gradually being removed. The Institute's form of contract and other contracts in use have specifically directed attention to the difference between ordinary and constant supervision. In time, the client will gradually come to recognize and appreciate this difference. At the present time, however, in a very large majority of instances, the client is still of the impression when he goes to the architect, and unless he has had prior experience in building matters, that it is the duty of the architect personally or through his organization, and without extra charge, to supervise the driving of each nail and the placing of each shingle.

One of the most common and dangerous misconceptions held by the owner relates to the cost of construction. Here again the owner is wont to endow the architect with powers of divination which he does not and cannot in reason possess. On the one hand, the owner expects that the architect can design a building to fall within any cost upset figure which he may give. On the other hand, he believes that the architect can give an accurate estimate of what the building will cost when erected in accordance with the plans and specifications presented to the owner for his approval. The client is wrong on both of these points. It is possible, of course, for an architect to be so conservative in the plans as to insure a building of a cost less than a given amount. Unless, however, he allows a very liberal margin for this purpose, he cannot be sure that the structure will not exceed the limit named. The best that he can do in the ordinary case is to design the building in accordance with his best judgment and, if the bids received exceed the limit, suggest changes and cuts which will reduce the cost to a figure below the specific amount. The owner cannot ordinarily understand why the architect cannot approximate the cost more closely in the first instance. One of the chief difficulties lies, also, in the fact that, after the more ambitious plan has been presented to him, the owner is loath to agree to the prunings and changes in the plans which are necessary to meet his financial requirements. This is only human nature, but it does not help the architect or work for a better understanding between owner and architect.

With regard to the giving by the architect of cost estimates, the owner is under a particular misapprehension. He believes, ordinarily, that the architect should, by reason of his experience in his profession and his technical training, be able to estimate with reasonable exactness the cost of the work called for by the plans and specifications. While he realizes probably, as a business man, the uncertainties of the labor and material markets, he nevertheless believes that the architect is so trained as to be able accurately to gauge these conditions and to give a substantially accurate estimate of cost. When it develops that an estimate given by the architect is over-conservative and that the cost is less than he has estimated, no harm is done. When, on the other hand, as is much more likely, the owner receives a bid far in excess of the estimated figure, his reaction in too many cases is that the architect does not know his business and that he has been misled into going ahead with sketches and plans for work which is beyond his financial resources. Under these conditions, he will either call off the project and object to paying the architect for the work already done, or he will proceed with the work and have changes made in the plans and specifications, but feel that he is not under any obligation to pay for the time involved in making these changes.

Another cause of irritation and difficulty for which the owner is often responsible results from his undertaking to give directions with regard to the work direct to the contractor or workmen and without the knowledge of the architect. Ordinarily, there is no intention on the part of the client to go over the head of the architect in taking action of this kind. In giving instructions to the contractor he has

little realization of the difficulties which may arise as a result. The contractor also is to some extent at fault, if he accepts instructions from the client without the approval or confirmation of the architect. On the other hand, it is quite natural if the owner, who is the principal in the transaction and the person with whom his contract is made, comes to the contractor and gives him a definite order, that the contractor should execute it. The client, by giving orders direct rather than functioning through the architect, seriously impairs the latter's authority.

This is not the most serious side of the matter, however. The more important thing is that the client, in ordering changes, has no conception of what they will entail. A change which to him as a layman appears comparatively simple, may result in other serious structural changes. These, in turn, result in "extras." Before the matter is concluded, the client in all probability will be blaming the architect for the very extras which resulted from the orders given by the client himself. Having employed the architect as his professional adviser, the client should support him in that position and, in his own interests as well as in fairness to the architect, submit to the architect and not to the contractor any suggestions or requirements which he may have. The architect will then be in a position to advise the client whether they are in his opinion reasonable and practical and what their general effect, both as to design and as to cost, will probably be. Often the client will realize that his suggestions are impractical and will drop them. Where they are approved by the architect, the latter will supervise their execution far more intelligently and effectively than the client could do.

The client, the owner and the contractor have each a well defined part to play. Each of them should keep within the limits of his own sphere of activities. The more completely this can be brought about, the less friction there will be and the better will be the results secured. The ordinary client is fair minded and reasonable. He desires nothing which is not right, and does not consciously intend to demand of his architect anything which is unfair. If he can, by slow but sure education, be brought to understand more fully the duties and limitations and problems of the architect, he will gradually revise his conception of the duties which the architect owes to him and of their respective rights and liabilities. The education of the client in this respect rests largely in the hands of the architectural profession. There can be no question that time given to forwarding such education in public and written discussions and in such other ways as may be possible, will remove many of the more dangerous points of irritation between architect and client and result in substantial benefit to each of them in the form of a better understanding and enhanced mutual good will and coöperation. I can conceive of no more worth while service which a publication such as THE ARCHITECTURAL FORUM, read by architects, contractors and laymen alike, can perform than to take an active and constructive part in promoting a better understanding by these three parties to the building project of their respective rights and liabilities. Such an understanding cannot fail to result in a general betterment of building trade conditions, in an increase in the effectiveness and authority of the architect, and in benefit to all concerned.

As a matter of fact, the owner is quite justified in feeling that the architect should be qualified and prepared to protect him with respect to many details of business administration in connection with the work. In the nature of things, the owner cannot be expected ordinarily to know what the building laws and local ordinances require. He cannot be expected to know the zoning and similar requirements as the architect is presumed to know them. He is not expected to be acquainted with fireproofing and other similar ordinances. The owner can rightly demand more of the architect than that the latter translate into plans the owner's desires. He can and should demand that the architect know whether those desires can legally be carried out, and that if there be any conflict between them and the requirements of the state or municipality in which the work is done, the architect should so advise him.

This does not mean that the owner can expect the architect to be his lawyer. It does not mean that the architect is obliged to advise the owner in matters relative to the building contract and he like which are properly matters for the owner's attorney. It is difficult to lay down exactly the dividing line. In general, however, it may be said that the owner is justified in expecting intelligent advice from his architect on those business or legal requirements which relate to the legal filing and approval of the plans. If the architect undertakes to prepare plans for a client, he is expected to so draft them that they *are* legal and such as the proper authorities will approve.

On the other hand, the owner cannot expect the architect to act as his guardian on all points connected with the work. On matters not clearly related to the architect's services, the owner must protect himself. The architect must use reasonable skill and diligence. He is not expected to be omniscient. He should be prepared and equipped to advise upon and attend to the business and legal requirements connected with his professional services. Beyond that the owner is his own keeper.

SANITARY DESIGN IN MODERN BUILDINGS

HOT WATER SYSTEMS

BY
HAROLD L. ALT

THE furnishing of an adequate supply of hot water for a building is one of the most uncertain problems involved in plumbing design. Types of buildings vary in purpose, and each building of each type varies from others in its requirements. The hot water system for a school will not be the same as that for an apartment house, nor will an office building have the same system as a church. Industrial buildings constitute a problem all by themselves; institutions, laundries, kitchens and bath houses must be considered individually, and the best possible judgment must be used in each case. No two authorities agree on the quantity of hot water which will be used in the various types of buildings, because there is so much variation between the amounts used.

Various rules have been evolved for computing the probable hot water demand for a structure, but there is nothing to guarantee that the occupants of a building are going to be governed in the slightest by the arbitrary assumptions made,—and which must be made,—in the original calculations. One method which seems to have at least a basis of common sense is to calculate the hot water required for the maximum use of each kind of fixture, and then to multiply this by a percentage of "probable" use for normal conditions and to allow *double* this for "peak" conditions. It will be noted that this method resembles that used for determining the sizing of cold water pipes. To apply this rule it is assumed that the maximum possible use of hot water in a lavatory is about a half-gallon of hot water for each user, and that an average washing in the lavatory would require about a minute and a half. Then the maximum number of gallons it would be possible to use in a lavatory per hour would be:

$$60 \div 1\tfrac{1}{2} \times \tfrac{1}{2} \text{ gal.} = 20 \text{ gal. per hour.}$$

A sink is taken at about 30 gallons per hour, and a slop sink at 20 gallons per hour; a bath is assumed as requiring 20 gallons for each user and that two baths per hour would keep the bathroom pretty busy; showers have been found to require as high as 300 gallons per hour when they are in constant use. This gives the maximum possible rates of water consumption in gallons per hour for each kind of fixture:

Fixture	*G.P.H. Max.*
Lavatories	20
Sinks	30
Baths	40
Showers	300

It is necessary to determine what percentage of maximum use is likely to be encountered in the particular building being considered. Shower baths are the most lavish users of hot water, and their use must be most carefully considered. The quantity of water used in a shower in a private bathroom or in a hotel room bath, for instance, would be quite different from that used for a swimming pool shower, because in the first case there would be only one or two users, who would probably not utilize the shower more than four times per day, while in the second case there might be a hundred users. This is why the "percentage of use" must be considered. The "peak" demand must also be taken into account. If the hot water were drawn off at a constant rate all during the day, there would be no object in using a storage type of heater; a continuous heater without storage would do just as well. But the hot water demand fluctuates, and the storage tank builds up a surplus of hot water during periods of low demand to have this available to carry over short periods of exessive demand. One authority says that the actual average hot water consumption for various fixtures located in different buildings is about as shown in this list. In using this schedule it should be noted that the quantities given are for net average use, and that no "percentage of use" factor need be employed.

Gallons per Hour (Average Use)

	Lavatories (Private)	*Lavatories (Public)*	*Baths*	*Showers*	*Sinks*
Residences	2½	x	10	50	5
Apartments	1¾	3½	7	35	3½
Hotels	3½	16	14	70	14
Schools	1¼	x	x	75	2½
Clubs	3	9	12	120	12
Gymnasiums	4	16	16	225	x
Hospitals	2¼	9	9	x	9
Public Baths	5	30	60	x	
Y. M. C. A.'s	3¾	15	30	x	15
Office Bldgs.	1	3	x	x	x
Shops (Indus.)	4½	27	36	270	18
Laundries	5	20	x	x	x

This table will also be an aid in checking up the "percentages of use" to see if the percentage assumed brings the net average use about to that shown in the table. It should be remembered that the ordinary peak load approximates *twice* the average demand.

The Storage Water Heater. This is usually a tank in which heating coils are installed, commonly termed the "multi-tube" type of storage heater (see Fig. 1). It not only serves the purpose of storing up hot water during periods when the full capacity of the heater is not required but also serves to reduce the boiler load for heating the hot water. Assuming an average hot water demand of 1000 gal-

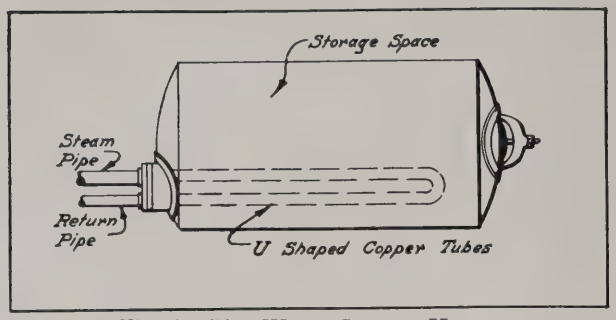


Fig. 1. Hot Water Storage Heater

lons per hour and a peak demand of 2000 gallons per hour, what would be the boiler load without storage and with storage? In the first case, with the water raised 100° Fahr. in temperature and taking a square foot of radiator surface as represented by 240 B.t.u., the boiler capacity used in square feet without storage will be

$$\frac{2000 \times 8\frac{1}{3} \times 100}{240} = 7944 \text{ sq. ft.}$$

but in the second case with storage provided of, say, 1250 gallons, and assuming that this 1250 gallons has been heated at some previous time of low demand, it will be necessary to heat only 1000 gallons per hour, making the boiler load under this condition

$$\frac{1000 \times 8\frac{1}{3} \times 100}{240} = 3472 \text{ sq. ft.}$$

or just half as much. Care must be exercised, however, to make the storage capacity sufficient to last over the *entire period* of peak load, because if it will not do this the reserve water will all be drawn out before the end of the peak period, as will be seen by assuming a water heater with 1250 gallons storage and 1000 gallons per hour heating capacity. If the peak load of 2000 gallons lasts only one hour, this heater will be sufficient, as it heats 1000 gallons and draws another 1000 gallons from its reserve during the first hour of the peak, leaving 250 gallons of hot water in the heater at the end of the first hour. During the second hour the heater will heat another 1000 gallons, but even after using the remaining 250 gallons in storage there will be a shortage of 750 gallons, and the hot water supply will fail almost immediately after the first hour period is completed. In actual practice it has been found impossible to draw out the entire storage without causing a general cooling of all the water in the tank, and for that reason a reserve of about 25 per cent of the total storage must be retained in the heater and *not used.*

Proportioning Heating and Storage. The relative quantities of heating capacity and storage capacity may be said to be represented by the equation:

$$\text{HC} + \text{SC} = \text{Peak Load} + 25 \text{ per cent of SC}$$

and this is based on the peak load, lasting about an hour as it generally does. HC (heating capacity in g.p.h.) should not be made less than the normal average demand as estimated, and storage capacity (SC) in general is made to equal the difference between normal demand and peak demand for the number of hours necessary to carry over from one period of low demand to another period of low demand. To illustrate, the peak load is generally double the normal load, and, based on this, what

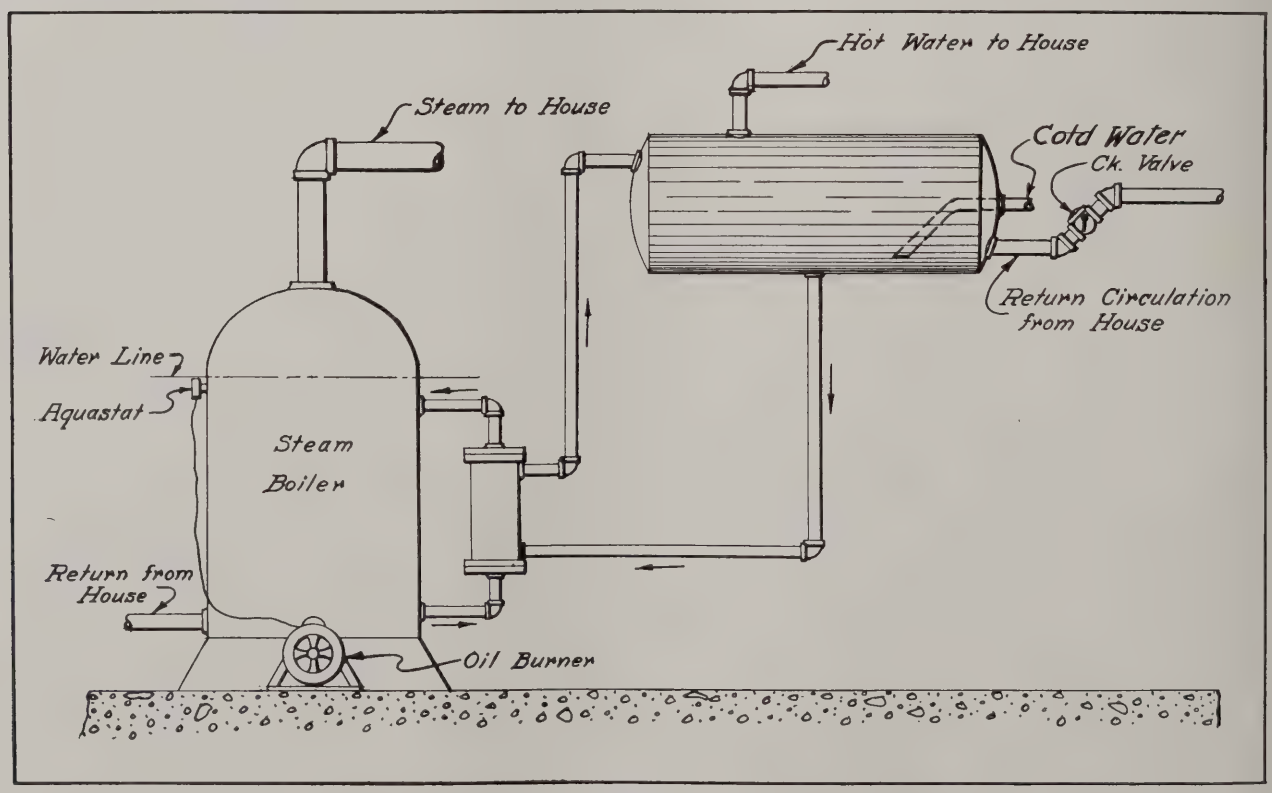


Fig. 2. Boiler and Storage for Domestic Hot Water

would be the combinations permissible for a normal demand of 1000 g.p.h.? If the peak load extends only over one hour, then the heating capacity must be sufficient to carry the normal demand or 1000 g.p.h. Substituting this in the equation, the result is

$$1000 + sc = 2000 + 25\%\ SC$$
$$SC - 25\% \text{ of } SC = 1000$$
$$75\%\ SC = 1000$$
$$SC = 1350 \text{ gal. storage.}$$

Then the heating capacity would be 1000 gallons per hour, and the storage capacity 1350 gallons. Should the peak demand extend over two or three hours, the SC must be doubled or trebled until the storage gets to a point where it is not desirable to further increase the size of the tank, at which time the HC must be increased.

To illustrate, suppose space conditions or some other reason made it undesirable to provide a heater of sufficient size to carry 1350 gallons, and instead only a 500-gallon storage could be obtained. What would be the necessary increase in heating capacity to give the same service? In this instance the SC is fixed at 500 gallons, and substituting this in the equation the result is:

$$HC + 500 = 2000 + 25\% \text{ of } 500$$
$$HC = 2000 + 125 - 500$$
$$HC = 1625 \text{ g.p.h. to be heated.}$$

Checking this over against the previous proportion, it is found that during the peak hour the first heater with 1000 HC and 1350 SC gives

1000 gal. heated + 1000 gal. from storage equals 2000 gal, for use, while with 1625 heating capacity and 500 storage capacity, and the second heater gives

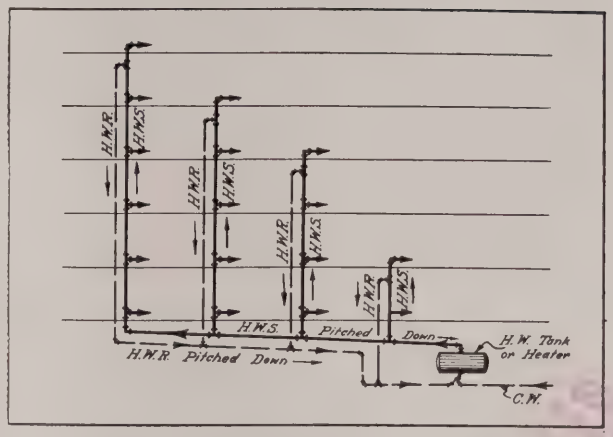


Fig. 4. The Upfeed Hot Water System

1625 gal. heated + 375 from storage equals 2000 gal. for use and in each case 25 per cent of the storage still remains untouched in the heater. The boiler load in the second case is higher during the peak hour than previously, owing to insufficient storage being provided. From this there may be deduced the general principle that if the heating capacity plus three-quarters of the storage capacity equals the peak load, the hot water supply will be sufficient provided that the heating capacity at least equals the normal load, and also provided that the storage is sufficient to carry from one time of low demand until the next.

The Instantaneous Heater. In some cases where the heating demand is a constant and continuous load, the instantaneous water heater is used. The most common use of such a heater is for a swimming pool, where the water is pumped through the heater at a constant rate. In the ordinary building the instantaneous heater is seldom used, since prac-

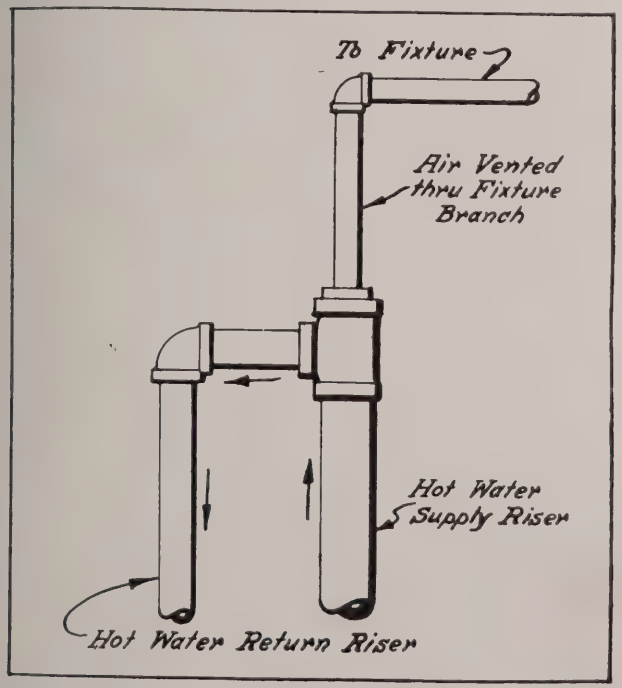


Fig. 3. Connection at Top of Riser

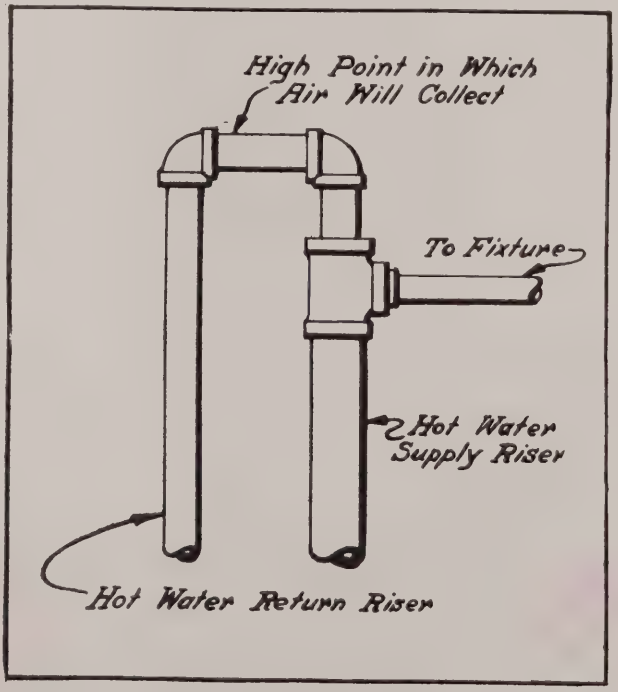


Fig. 5. Wrong Connection at Top of Riser

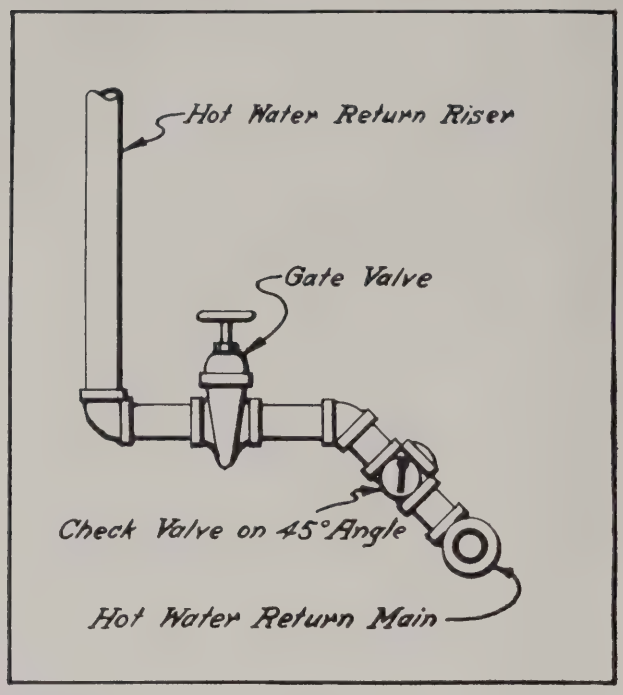


Fig. 6. Gate and Check Valve Connections

tically all building demands for hot water are of a fluctuating character. Small heaters of this type are used to advantage in residences and they are quick-acting; in some cases turning on the hot water faucet starts the heater in action.

Summer Supply. While there is very little difficulty usually in obtaining steam for heating water during the winter, in the summer season when no heat is on in the building it is sometimes a problem to know just what to do in order to care for this condition economically. In a very small building or in a structure where the number of plumbing fixtures is limited, use of an automatic gas water heater of the storage type with thermostatic control is probably the best solution. In larger installations, a small cast iron steam boiler to supply steam to the coils in the tank may be used.

Another method which has come into vogue recently with the advent of oil burners is to use one of the oil-burning boilers during the summer with an indirect heater in which the water for domestic service is heated. This is illustrated in Fig. 2. The oil burner may be controlled by an aquastat placed on the boiler. This turns on the oil burner whenever the temperature of the boiler water goes below 200° Fahr. and shuts it off whenever the boiler water reaches 210° Fahr. In this way no steam is produced, and the boiler water is kept at about 205° Fahr.

The little indirect heater consists of an iron casting or shell which is connected by circulation lines to the boiler, so that the water in the indirect heater is also kept hot. Inside the casing of the indirect heater is a copper coil, which is connected by circulation lines to the storage tank or heater. If the indirect heater is set below the water line of the boiler,—as it should be,—hot water will be obtained as long as the main steam boiler is not allowed to get cold. This arrangement will do equally well for winter use by simpy cutting out the aquastat control on the main steam boiler and switching over to pressure control for the oil burner.

System of Circulation. The arrangement of pipes to carry the hot water to the point where it is to be utilized must next be considered. In every installation of any size, a circulation system should be employed on the basis of convenience to the user as well as of economy of water consumption. The circulation line should be carried within 18 inches of the fixture outlet whenever possible. Hot water circulation is obtained by gravity, except in very rare cases where a pump may be used. Gravity is particularly feasible in tall buildings, whereas a forced circulation by means of pumping is necessary only in low buildings covering a large area, such as one-story industrial shops, etc. Circulation by gravity is obtained in two ways,—first, by what is known as the "upfeed" system, in which supply lines are carried up and return lines are carried back down to the basement, with both supply and return mains located in the basement; and second, by what is known as the "overhead downfeed" system in which all outlets are taken from returns supplied from an overhead main located at the top of the building, the main being fed from a single main supply riser from which there are generally no branches. The bottoms of all the returns are connected and are carried back to the hot water heater, thus completing the circuit.

The Upfeed System. In the upfeed system (Fig. 4) it will be noted that each group of fixtures, since the groups come over one another, is supplied from a special hot water riser, and that in order to have this riser circulate, a branch is taken off the top and carried back to a return main in the basement, this return main usually paralleling the supply main. The hot water outlet from the heater or tank is connected to the supply main, and the return main, after picking up all the circulation lines, is run back and united with the cold water makeup line, both being carried into the hot water tank or heater through a common pipe connection.

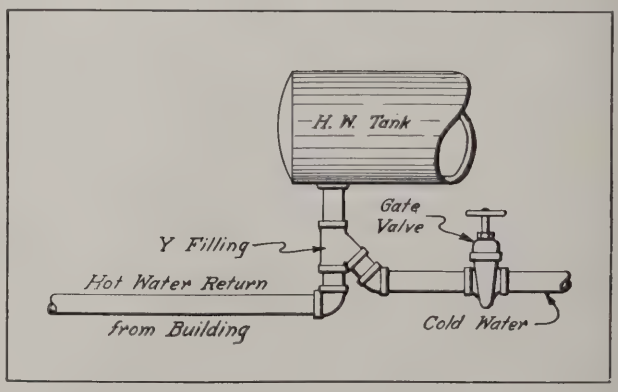


Fig. 7. Good Connection of Cold Water Supply

In "sizing" this supply pipe, the supply risers are sized first, and then the main supply is made large enough to carry the risers, increasing in size as it approaches the heater. In order to secure good results, it is necessary to pitch the supply up continuously from the heater to the last riser in order to prevent air from accumulating and interfering with the circulation. Any horizontal offsets in the riser must also be pitched up in the direction of the flow. At the top of the riser, air relief is usually provided through a fixture connection as illustrated in Fig 3. If the top of the riser is connected into the return circulation line, as shown in Fig. 5, the top of the loop will become filled with air, and circulation will cease. As the tendency to circulate is produced only by the difference in the weights of the columns of water standing in the supply pipe and in the corresponding return pipe, and as this difference in weight is dependent on the small amount of temperature difference, it will be understood how a very small quantity of air pocketed in the line at any point will interfere most seriously with the circulation. The return main is pitched downward in the direction of flow. Owing to usual returns being connected into one main return, it is necessary that each return line (which is usually made of ¾-inch size) be connected into the main return through a check valve, and of course a gate valve. In order that the tongue of the check valve shall offer as little resistance as possible to the circulation, it is desirable to set the check valve on a 45 degree angle so that the tongue will hang vertically, as shown in Fig. 6.

The circulation may be accelerated by connecting the cold water make-up into the hot water return through a "Y" fitting, so as to get the benefit of the injector-like action caused by the inflow of cold water whenever a faucet is opened, as shown in Fig. 7, instead of connecting the cold water line to the tank, where the inflow of cold water does not aid in helping the circulation. Regardless of the size of supply riser, a ¾-inch return circulation line is always sufficient to keep the supply line hot, since the only function of this line is to allow the water in the pipe

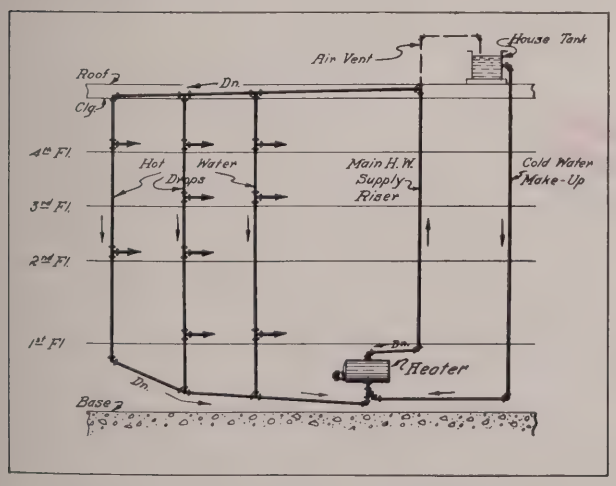


Fig. 8 Overhead Downfeed Circulating System

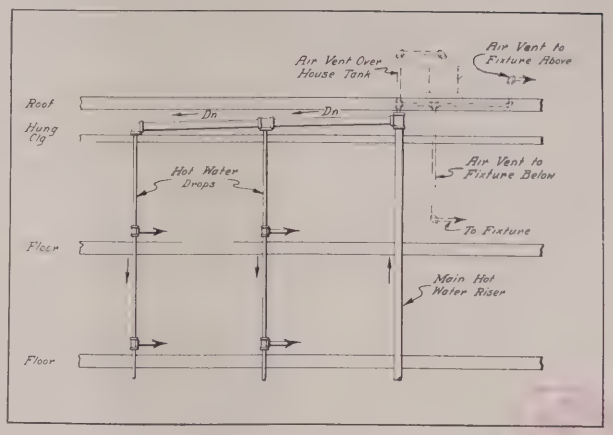


Fig. 9. Three Methods of Venting the Circulating Hot Water System

to flow back to the heater when no water is being used; when water is being drawn from the faucets in any quantity, the line will stay hot; but when no water is drawn off for a long period, the entire contents of the pipe will cool down unless circulation provision is made.

Overhead Downfeed System. In this system of circulation, all the hot water is carried to the top of the building in one main hot water riser and is there distributed horizontally to the various hot water drops which proceed down through the various floors, supplying the fixtures at each level. At the bottom, each drop is connected into a hot water return main which is carried back to the source of supply. Fig. 8 shows a typical circulation system of this character. Better results and less short-circuiting will probably be found in the overhead downfeed scheme, than in the upfeed type. One of the advantages gained in using the overhead downfeed system is that if the hot water tank is located anywhere near the main riser, the heater or tank may be kept comparatively high, owing to the small amount of upward pitch necessary in the short run to the riser; in the upfeed system the supply piping must slope up continuously from the tank or heater to the farthest riser in the building, often encountering low beams, resulting in the heater or tank being considerably depressed in order to maintain the proper pitch on the supply pipe.

Too much emphasis cannot be laid on the importance of pitch in circulating hot water lines; beginning at the tank or heater, the main supply must grade up to the main riser, which runs vertically and usually extends up to the high point on the system from which a small air vent,—of either ¾-inch or 1-inch pipe,—is carried up to, and spilled over into, the house tank. This air vent may also be carried up to a fixture at some higher level, or it may be taken off the top of the riser and then returned to supply some fixture below, the air rising into the top of the bend where it does not interfere with the circulation, and being forced down and out of the fixture outlet when the faucet is opened from time

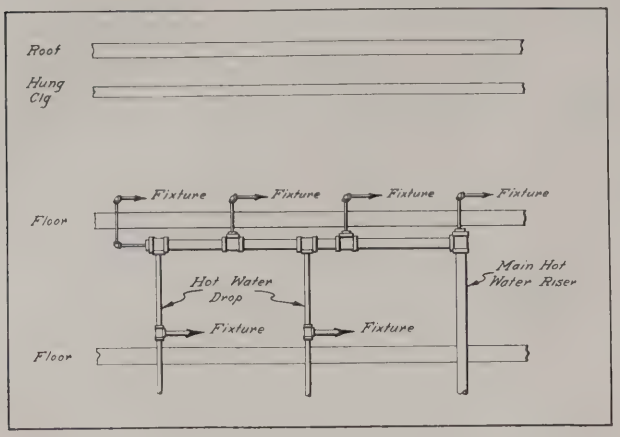


Fig. 10. Venting at Fixtures Above Hot Water Main

to time by the flow of water going to the fixture. These three methods of venting are illustrated in Fig. 9. Where possible, it is better to run the horizontal distribution main on the ceiling or in the furred ceiling under the top floor, and not under the roof as is usually done; this permits economy in piping and covering, a shortening of water travel, and air venting at numerous points; venting occurs wherever a fixture is located on the floor above, as shown in Fig. 10.

Hot Water Pipe Sizing. Hot water lines may be sized on the same basis and by the same methods as used for cold water lines as already explained. The sizes will not run as large as the cold water lines because, (a) all fixtures do not require hot water; (b) there are no connections of over ¾-inch size; (c) the hot water is not used as much as the cold water in most buildings.

In batteries of lavatories, showers, etc., where a large number of fixtures of the same kind are supplied with both hot and cold water, the hot water supply is usually made the same size as the cold water. It should also be remembered that, as all the hot water withdrawn from the system has to be replaced by cold water makeup coming into the heater or tank, the size of this cold water connection will have to be sufficient to supply the total hot water demand at peak load. It frequently works out that the combined area of all the ¾-inch returns when added to the area of the cold water makeup line will exceed the hot water supply pipe area; but the circulation proceeds when no makeup is entering the system, and consequently both lines do not necessarily deliver at their full capacity at the same time.

Hot Water for Showers. Shower baths require particular protection against excessive temperature water in all cases, but particularly when arranged in batteries for the use of children, as occurs in high schools, swimming pools, and some institutions. If the shower installation is sufficiently large to justify a separate hot water heater thermostatically controlled, so that the maximum temperature of water delivered to the hot water side of the showers does not exceed 100° to 110° Fahr., this is the best answer. Where this seems unduly expensive or structurally unwise, hot water may be taken from the central system and run through a thermostatic mixer where a certain amount of cold water is automatically added, the cooled water entering a "mixed" water line which is used for the hot side of the showers. Further protection may be obtained by inserting a thermostat in the mixed water line with a stop valve so that all mixed water is shut off as soon as the mixer fails to work properly and the temperature exceeds the desirable safe limit. This is illustrated in Fig. 11. In single showers, the use of the thermostatic mixing valve is efficient if a "mixed" water line cannot be obtained for the hot side. In kitchens, laundries, and industrial processes requiring special high-temperature water, it is advisable to use a separate heater or,—if high-pressure steam is available,—to use a thermostatic mixer specially designed for this purpose.

All hot water lines, both supply and return, should be covered with insulation, and the radiation from circulating lines should be allowed for in determining the heating load of the hot water heater.

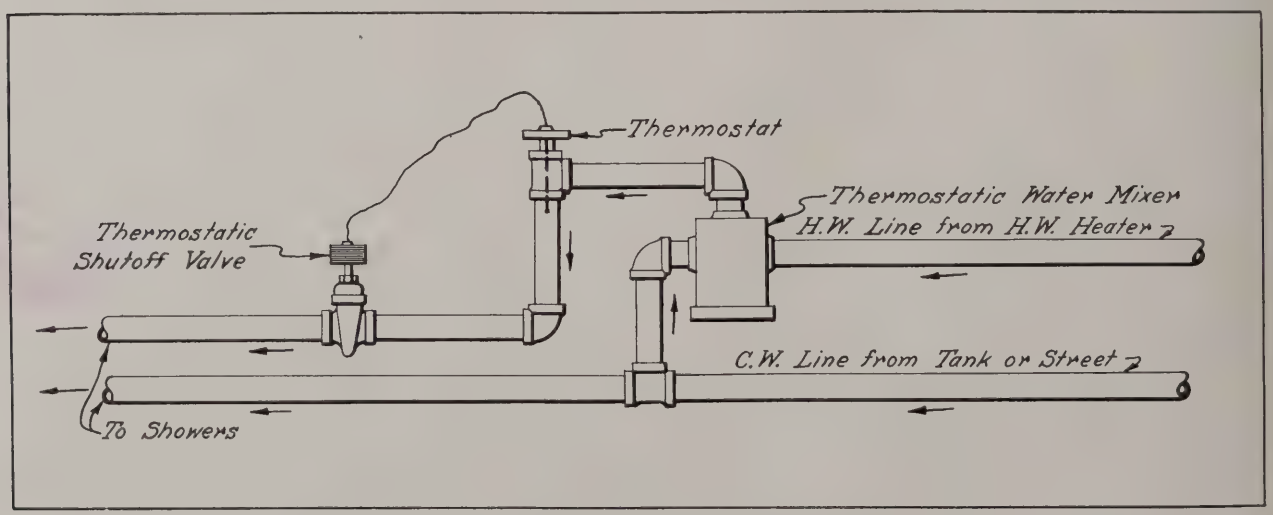


Fig. 12. Thermostatic Shutoff for Shower Supply

HOUSES OR STAGE SCENERY?

BY

H. VANDERVOORT WALSH

WE are going through a very strange period in our domestic architecture. It is a make-believe era. We seem to want to live in dream houses, in quaint, old fashioned houses, in fantastic castles. In the working parts of our homes we demand practicality, but we try to clothe it with a veil of unreality. Perhaps life, with all of its grind today, is too wearing on our nerves, and we think of home as a retreat from the cold, bitter facts of our existence. Whatever be the cause of this feeling, the evidence is growing on every hand that people are demanding houses that reflect, not our own age, but some other past age. But this desire to live in a house that looks two, three, or four centuries old seems to be stimulated by the great number of magazines which publish soft and appealing illustrations of picturesque homes. Houses that are unreal, that are built like stage scenery, look very well in illustrations, for pictures are, after all, quite unreal. I believe these alluring views have helped to lead people on to imagining their homes as places of escape from life. They have stimulated them to want mediæval houses, for what dwellings are so romantic, so picturesque, so like the houses we read about?

American architects, sensing this some 20 years ago, were trying to design houses as they were built in the middle ages. In their trips through Europe, they were carried away by the picturesque quality of the very old English cottages and manors, and by the half-timber buildings in the towns, the houses of Normandy, and the quaint peasant homes along the French country roads. The urge to reproduce them was tremendous, and so they tried it, but failed. Their houses were hard and unromantic. The timbers which they put into them, in imitation of half-timber construction, were obviously sawed and planed planks of wood, veneered onto the faces of the walls. The stucco between the timbers was smooth and finished, like a piece of good, mechanical plaster work. The roofs were true, for rafters were cut straight by mechanical saws. The shingles or the slates were square and shiny, with perfect machine cutting. The whole appearance of their houses was as far away from that of the old, mediæval dwellings, which they had seen, as America is from Europe. Instead of being appealing, like a castle in a dream, they were cruel reminders of the hardness of a mechanical age!

But man is resourceful in his search for the things of his dreams. Some clever architects discovered that with a little trickery they could remove this hardness of the machine. Instead of using straight sawed planks, veneered onto the exterior to imitate the half-timber construction, these planks were subjected to a hacking process. The carpenter was instructed to rough up on the surface with his adz. The straight edges of the planks

Stage Scenery or Architecture?

were cut to wavy profiles, such as a solid timber would have had had it been adzed to shape from a tree. At a distance, when these doctored boards are nailed in place, they look like the real old thing; they seem to be heavy timbers, cut down from the nearby woods and set in place after having been shaped by axe and adz. The stucco placed between them (only about an inch thick and on metal lath!) was also subjected to a roughing process to make it look like solid, hand-laid masonry, such as was stuffed between the large timbers of the frame. It was gobbed on with a careless trowel and roughed up with a scratching stick and bespattered with the colors of old age. The illusion was perfect,—for those who knew a little about half-timber houses and had traveled in England. Atmosphere was acquired by a few dollars judiciously spent in getting good mechanics to work in a slovenly manner.

Now the architect had turned the trick. The half-timber house took on a beauty, under his direction, that was in harmony with the style. A touch here and there of a little stain; a broken stone or tile placed carefully; old vines and shrubbery cleverly located at critical points, finished the picture. His intellectual and moneyed client who had traveled and knew the periods of the various styles of architecture, applauded. A scholar and an artist, this architect must be! Such a romantic place to live! Such a relief from the world of mechanical things! So picturesque, so quaint! It was a triumph for the profession. Manufacturers were quick to catch the idea, and supplied the architects with the materials.

In ten years our domestic architecture, of the better class, took on a dignity and charm that Europe needed hundreds of years to acquire. Photographs of ancient masonry and brickwork were given to American-Irish masons, and they were told to build walls as nearly like them as possible. These good hearted men tried, in spite of the ridicule of their fellow laborers. Measured drawings of ancient buildings multiplied in all the periodicals. Studies with camera and pencil were made of the textures on old materials, so that the hard, machine-made thing could be hacked, clubbed, cut, cracked and smeared into a thing of beauty. And now the public has taken the doctrine of faking seriously. It has learned to love the spirit of the antique. It pretends to hate anything that is made by machine. If it cannot have a real hand-made product, it must look as though it were hand-made. The speculative builder has sensed the taste, and met the demand.

Never has there been such a conglomeration of construction materials as we are getting in the majority of our houses today. Riots of color in the roughest of stucco; plaster walls smeared with "plastic paint," a material never known before the age of American faking, are seen multiplying by the thousands. Oak timbered ceilings are made out of plaster or asbestos sheets in imitation of famous oak ceilings of old England, perfect reproductions for the untrained eye and almost deceptive to the trained; imitation wrought iron strap hinges on front doors, hinges which end at the edge of the door, the door itself swinging on common butts; old, battered lanterns, lighted by modern electric lights; yellow pine, pounded with a hammer and stained to look like ancient oak,—the fakes are innumerable and growing in number every day. Our houses are wild with "picturesque" things, stunts, curves and gable ends that swing down to the ground with no houses behind them. Everywhere we see houses of the old English farmhouse type, erected by speculators from the plans of "architects" who sell the designs, relinquishing all further interest in the development of the schemes. Many young architects turn these plans out on the side, as pot-boilers, getting from $50 to $75 per set. When such houses are turned over to the mercy of the builder, he develops them with his own choice of building materials that give the roughest kind of textures. He thinks he is simulating the work of the best architects, but this matter of using machine-made materials in imitation of the hand-wrought product requires the dexterity of a prestidigitator and the skill of the scenic painter to simulate reality. Although the design may have much in its favor,—suitable plan, and pleasant proportions of parts, etc.,—when this doctoring of materials is carried on by the uncouth builder, the results are monstrosities.

The sins of the professional architect have trebled themselves. His delicate art of retouching materials has grown to be a commercial necessity. Our magazines are filled with colorful advertisements, showing roof tiles, bricks, stucco, plastic paints, floor tiles, plaster ornaments, wrought iron hardware, and many other materials which are sold in a faked condition. Machines have been made which will stamp the touch of the craftsman all over the material. Each wrought iron object can have the same marks of the hammer of the craftsman in the same places, reproduced a thousand times. Wooden beams for the ceiling can be run through machines with revolving knives that will indent the surfaces like the cuts of a hand-swung adz,—only the machines will chip regularly every 2 inches, producing a marcel-wave texture. Plaster surface can be given the appearance of ancient work by covering it with plastic paints, and smearing it.

All this effort, all this added expense, is the result of the leadership of architects who have insisted on designing their houses in those styles which were developed during the days of no machines and when craftsmen worked with their hands. They have set the fashion, and the little fellows have copied, and the manufacturers of building materials have redesigned their machines to produce the kind of product that the fashion demands. Now is it not about time that architects of good taste recognized this dishonest use of building materials? Is it not time to begin building without disguise of materials produced by machines? Ought we not frown on use of all those styles of architecture which depend for effect on stage scenery, which imitates the work of the hand craftsman and the patina of age.

BUILDING FUTURE REAL ESTATE VALUES INTO HOMES

BY
TYLER STEWART ROGERS

UNDER the pressure of routine problems of design and specifications, of getting commissions and of executing them, there is a perfectly natural tendency on the part of some architects to neglect some of the fundamental problems which underlie all successful architectural practice. Particularly this is true of the economic aspects of building operations, which frequently become submerged under considerations of design features, clients' demands and ideas, and matters of expediency. The basic value of an architect's service lies almost wholly in the fact that it should produce a recognizable value, indeed a commercial or market value, greater than its cost, and consequently greater than of the building the owner could achieve without the architect's help. This article is concerned with the fundamental importance of constantly creating future real estate values in the designing and construction of homes.

Such neglect of this important matter as may be evidenced in the typical modern home arises in a very natural way. Today there is almost unprecedented interest in architectural styles, and home builders are vying one with another to create something particularly fine (or unique) in every style from the mediæval to the extreme modern. The vagaries of style popularity are dominating all architectural problems. The danger lies in the inpermanence of the popularity of styles, especially of those of the more eccentric and hybrid character,—and impermanence is a luxury few can afford in the development of a home. The vast majority of residences designed by architects are built primarily for occupancy by the clients. Naturally, the latter desire their homes to be designed to meet their particular requirements as to plan, accommodations and equipment, and to accord with their preferences as to style. In establishing his basic requirements, the owner is influenced by the size and composition of his family, his social habits, his hobbies, furnishings, taste, and his conceptions of luxury. Only rarely is he concerned with that future date when the property may change hands. He is building for himself, and "he wants what he wants."

Nevertheless, there is always the economic aspect to consider. Our present mode of living is in itself too impermanent to warrant the thought that an individual home is being built for future generations of the same family. Changes in family requirements for accommodations, a removal of business to another locality, an increase or decrease in the family income, death or the stork, or changes in the neighboring environment may result in forcing the house on the market, contrary to all previous intentions. Very often there is the opportunity to sell at a profit through a substantial appreciation in land values. The average house, built for occupancy, finds its way into the realty market, not once, but usually several times in a generation. At the same time it represents a major investment on the part of the client; an investment, in fact, that usually represents a substantial part of the owner's total estate. To be sure, this works out in an inverse ratio to the size and cost of the dwelling, for those who can build the more costly homes usually invest a smaller percentage of their wealth in the enterprise than those who seek more modest accommodations. It is of the utmost practical importance to conserve the investment and to surround it with every possible protection against depreciation and loss.

From an investment point of view, the minimum requirement is that the property at all times shall have a value equal to the original investment after deducting a fair charge for rent during the period of ownership and occupancy. It is not necessary to anticipate a complete recovery of the initial cost, for a building is not like a bond having a fixed recoverable value; depreciation, obsolescence, and maintenance charges must be anticipated. Only the land normally represents a true investment, having supposedly stable and undiminishing value. If the land enjoys an increment during the period of ownership, that increment represents a speculative return, and strictly should not be considered as an offset to undue depreciation in the value of the dwelling.

It may not seem difficult to so design and construct a dwelling as to meet this minimum economic requirement. There are many influences working at variance to this end, however, not the least of which is the owner's attitude toward his project. Furthermore, the last five years,—in fact the last 15 years,—have seen such inflation of values in real estate that many home owners and even bankers have come to expect at least a modicum of profit from their home building investments in the event of sales, and the economic standard just outlined represents less than a satisfactory outcome of their enterprises. In practice the architect has failed in his work if he has not injected into the project more than average stability in real estate values, barring only those projects in which the owners can afford to neglect entirely the economic phases, and indulge in the pure luxury of building what they want without respect to what other people will pay for it later on. The real test of the architect's product economically is the auction block. Here real estate values are established and measured. When two dwellings of equal size and accommodations reach the auction block together, after discounting land values, the difference in the prices they bring is a real dollar measure of the architect's skill and its value. The difference in price is then due either to matters of design or of construction, or both, and these matters are dis-

tinctly within the province and largely within the control of the architect.

There are four factors that influence the market value of a home. They are (1) obsolescence of style; (2) obsolescence of plan; (3) structural depreciation; and (4) neighborhood depreciation or appreciation. Expressed more positively, and with reference to new properties, the factors may be defined as, popularity of style and plan; quality of construction; and desirability of location and site.

Architectural Style; Its Market Value. Style popularity, or the "vogue" of architectural styles, is probably the most important single factor endangering stability in the market values of homes. Recently we have all seen the rise and fall in popularity of early Colonial, English, French, Norman, Italian, Spanish and other more or less readily defined period styles, and today we are watching the development of the "Modernist" style. The vogue changes almost as rapidly as styles in dress and motor cars. Travel, motion pictures, and even the radio, and more particularly the popular home building magazines themselves, have developed a surprising breadth of taste, and have largely wiped away the former regional preferences for one style. There is no longer an adherence to a "native" style; probably there never will be any unified, predominant style. The changing vogues are psychological in their origin; they are likely to run in waves or cycles and can, to all practical purposes, be neglected.

The permanent values in architecture are appropriateness and excellence of design. Considering design features only, those houses which possess the greatest excellence of design for their respective types command the highest prices when on the auction block. Popular appreciation of good design is not as insignificant as many students are led to believe. Appropriateness of design is a factor, for a house unsuited to its locality and environment is discounted in value. This means that the architect, seeking to establish permanent real estate values in the dwellings he designs, must avoid those eccentricities of design which are the outgrowth of either the clients' lack of perception of design values or the architect's ambition to do something unusual,—which frequently means something bizarre.

The owner is very frequently at fault in preventing the architect from doing his best work by insisting upon features of plan arrangement, ceiling heights, and other details which are at variance with good proportion and balance; or by insisting upon the use of materials inappropriate to the design that has been adopted; or more frequently by insisting on subsequent changes in the drawings or specifications to reduce cost, which often ruin the very features upon which the architect places the greatest reliance for achieving a successful and excellent structure. There is plenty of evidence in every suburb to support this statement. Speculative builders endeavor to emulate the more successful designs developed by skilled architects, but in doing so they lack the appreciation of details and refinements which distinguish the work of the real artist. Their products are frequently horrible examples of poor design, even when their inspiration may be drawn from excellent buildings. Those dwellings which retain their values over the longest period of years are those which are conservatively designed. Eccentricities are usually of very impermanent value. They may have vogue for the moment, but as public taste improves and as years go by, the oddities are exaggerated and detract from the value of the property. If one pauses to examine the work of those architectural offices which have achieved the most enviable prestige in the domestic field, one cannot help but note that conservatism is the keynote of their designs. They are rarely guilty of the fault of wasting time or effort endeavoring to achieve something wholly different or unique. Their products almost invariably have high and enduring market value.

Market Value of Intelligent Planning. Planning is extremely important in maintaining market values, and here again the owner's preconceived idea is frequently the most difficult factor to contend with in developing a plan for a house which will be salable later on. In plan the owner is most likely to express his individual requirements to the greatest degree, for while he may be willing to leave matters of style and decoration in the more expert hands of an architect, he feels himself competent to lay out a plan which will meet his own family requirements and personal ideas of convenience and luxury. The usual result is a plan that will fit only his own needs and which will be poorly adapted to the requirements of another owner. This unorthodox type of planning endangers realty values in various ways. If it results in an extended plan with many projections and irregularities, it increases the cost of construction without proportionately increasing the accommodations or the desirability of the structure as a whole. It may be poorly adapted to the more nearly normal requirements of a typical buyer. The social habits and housekeeping habits of the original owner may also be at variance with normal customs, resulting in a plan that is inconvenient and difficult to maintain. It is the architect's business to keep the owner's requirements within the bounds of reason in order that the house may be more truly adapted to average requirements, lest the market value ultimately prove to be far below the initial cost. He should bring these considerations to the attention of his client.

Market Value of Good Construction. Permanence in realty values obviously depends upon sound construction. An attempt to economize on structural details through the use of inferior materials nd poor workmanship is shortsighted "economy" of the worst type. Equally dangerous is the adoption of untried materials, either for the sake of economy or through curiosity to see how they work out. Many of the new products are excellent, but for every one that is good there are several which are merely

cheap substitutes of unproved merit. Furthermore, a substantial proportion of the new products are developed to satisfy stylistic trends. For the time being these products may be very much in vogue and yet ultimately have no permanent value, especially when their use has been overdone. An example in point is the present use of plastic paints and other similar products used to achieve special decorative plaster effects. The materials that have been developed for this purpose are highly successful when properly used. Some of them are necessarily better than others, but all of them are susceptible to abuse. There has been a notable vogue for the rough plaster effects characteristic of the "Mediterranean" styles of architecture and some of the more primitive English and early Colonial dwellings. In the hands of a skilled architect these materials may be properly employed with the same restraint that is exercised in the use of many other decorative finishes, but the danger lies in their use under inappropriate circumstances and in exaggerating the effects beyond the limits of good taste. Actually, in the hands of speculative builders and those who have not appreciated the design limitations of these products, they have been so thoroughly abused that they are rapidly becoming in danger of losing their popularity. If this situation develops further, those dwellings which have been finished in this manner may lose something of their market value because such wall finishes are very difficult to remove. Only where they have been used with due consideration to their decorative precedents are they likely to contribute to the stability in market value of the dwellings in which they are employed.

A careful balance must be maintained between that ultra-conservative attitude which uses only tried and proved materials of a generation ago, and the ultra-progressive attitude which adopts without question and without proof the new products which daily enter the building market. Ten years hence a house which lacks those structural features which today are new but which possess such sound merit as to result in subsequent universal employment, will be out of date and subject to loss through obsolescence as compared with another building of equal age in which such materials have been properly employed. A half-dozen materials of this nature might be suggested, including insulation materials, the value of which has already been established beyond question; the use of tiles in bathrooms (preferably with the introduction of some color); and the use of modern heating systems selected for their efficiency and economy of operation and their susceptibility to practically automatic control.

Stabilizing Neighborhood Values. The fourth factor which influences future realty values,—the appreciation or depreciation in neighborhood land values,—may appear to be beyond the control of the architect. To a large extent this is true, except insofar as the architect may advise his client with respect to the selection of the site and contribute to the adoption of sound zoning regulations and other protective methods designed to stabilize realty values and to protect neighborhoods from an undue change in character. Nevertheless, the architect has one important responsibility in this respect, for it is part of his problem to design his client's house in a style and character which is well adapted to the chosen neighborhood and which will fit gracefully into the environment. The introduction of a Spanish type house in a colony of well designed Colonial structures may not only detract from the neighborhood's values but may be so out of place as to immediately penalize the owner, should he be seeking a loan or undertake to sell his property shortly after completion. Likewise, the development of a $50,000 house sandwiched between $20,000 structures endangers the client's investment far more than it enhances the value of the neighboring properties. Preventing such mistakes is definitely part of the architect's responsibility to his client, and in disseminating sound advice on these points the architect is also fulfilling his implied responsibilities to the community.

Realty Values and the Banker. We previously made the statement that the auction block supplies the crucial test of the architect's product, but there is another and more immediate test which frequently measures the value of the architect's services to his client. In the event a new home is to be financed partly on funds secured through a mortgage loan, the architect's drawings and specifications are subjected to the scrutiny of expert appraisers employed by the lender, appraisers whose function is to establish the market value of the completed property. Mortgage loans are not based only upon the cost of a house. The lender is concerned only with the protection which exists above the amount of the mortgage he grants in the event the property is forced upon the market through foreclosure or otherwise; in other words, the auction block value of the property is the only value that interests the lender. Under this critical test eccentricities of design and plan are measured as extravagances which have no value as bases for a mortgage loan. The extra cost of features not in accordance with popular taste and demand is immediately discounted. The appraisers may go further and consider eccentricities as injuring the market value of the property, thus lessening the size of a loan which may be obtained. The same consideration applies to luxurious features, details such as expensive paneling, decorations, etc.

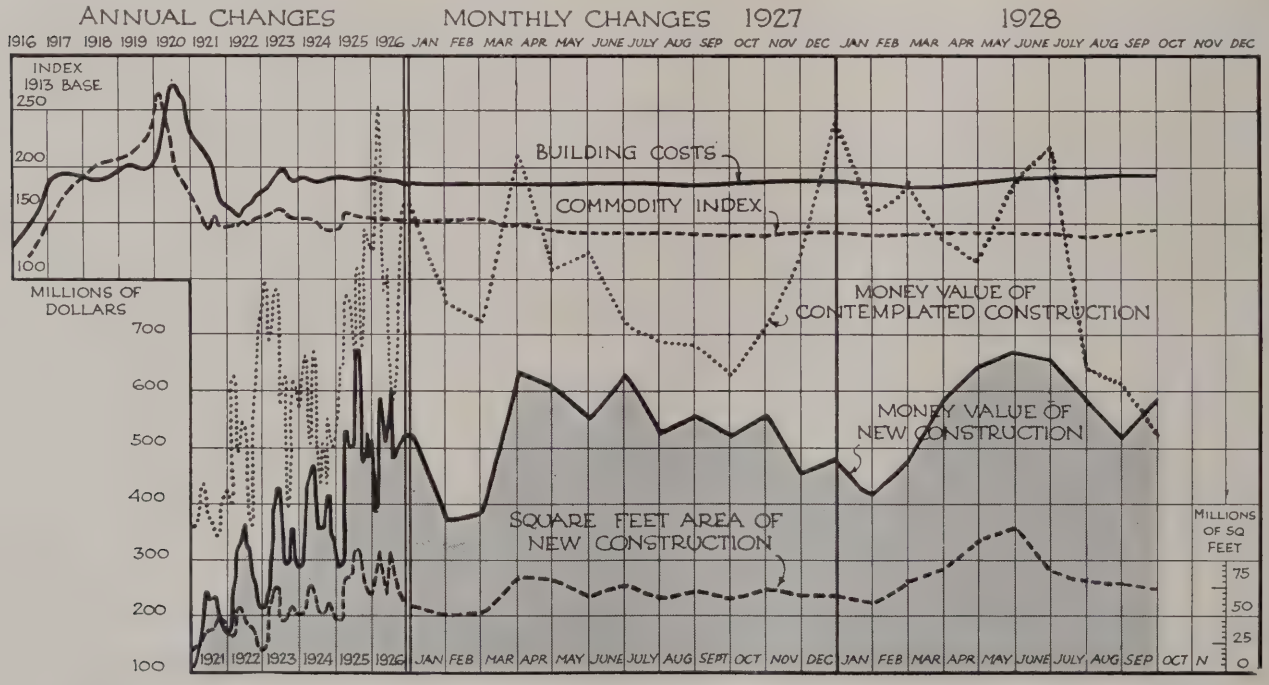
The best general guide to creating future real estate values in homes is to maintain a sane balance in design, plan, and construction so that a due proportion of the investment is devoted to structural details and a reasonable proportion to the matters of plan arrangement, decorative treatment, and finish. If the owner insists upon an unorthodox structure, the architect at least should call his attention to the probability that the ultimate market value of the property may be less than the owner anticipates.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THIS year has been notable for the number of construction records broken month by month and for the cumulative totals during the first eight months of the year; and September construction continues this intensive activity. In the territory east of the Rocky Mountains construction contracts reached a total of $587,674,000, according to the figures of the F. W. Dodge Corporation. The area covered includes the 37 eastern states and represents approximately 91 per cent of the total construction in the United States. This construction total was 13 per cent ahead of the total for September, 1927, and 14 per cent ahead of the figures for August of this year. As a consequence of this activity, the cumulative total for the year represents a 7 per cent increase over the corresponding period of 1927. In analyzing these figures it must be noted that $86,000,000 is accounted for by five extraordinary construction contracts in the industrial and utility fields. A $40,000,000 power development in New Hampshire; a $10,000,000 rayon plant in South Carolina; a $9,000,000 coke plant in Pennsylvania; a $5,000,000 steel mill in Ohio; and subway contracts in New York of $22,000,000 play a part. The eastern states established new records, and the central and western states showed declines as compared with building activity during the preceding month and during the corresponding month of last year.

The outstanding items in the September building record include: $202,806,900, or 35 per cent of the total, for residential construction; $119,013,600, or 20 per cent, for public works and public utilities; $114,780,300, or 19 per cent, for industrial buildings; $60,068,000, or 10 per cent, for commercial buildings; $38,800,500, or 7 per cent for educational buildings; and $23,845,700, or 4 per cent, for hospitals and institutions. New projects contemplated and reported in the 37 eastern states amounted to $522,655,600, which is a decrease of 15 per cent from the total reported in August, 1928, and a drop of 17 per cent from the amount reported for September of last year. This decline in new projects, taken into consideration with a similar sharp decline during the preceding month, may be partly accounted for by prevailing high interest rates and a restriction in the money available for construction purposes. An analysis of the regional figures shows several trends which must be considered in the light of the five large contracts just noted. New York state and northern New Jersey showed an increase in September contracts of 22 per cent as compared with the preceding month, and 46 per cent as compared with September, 1927.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

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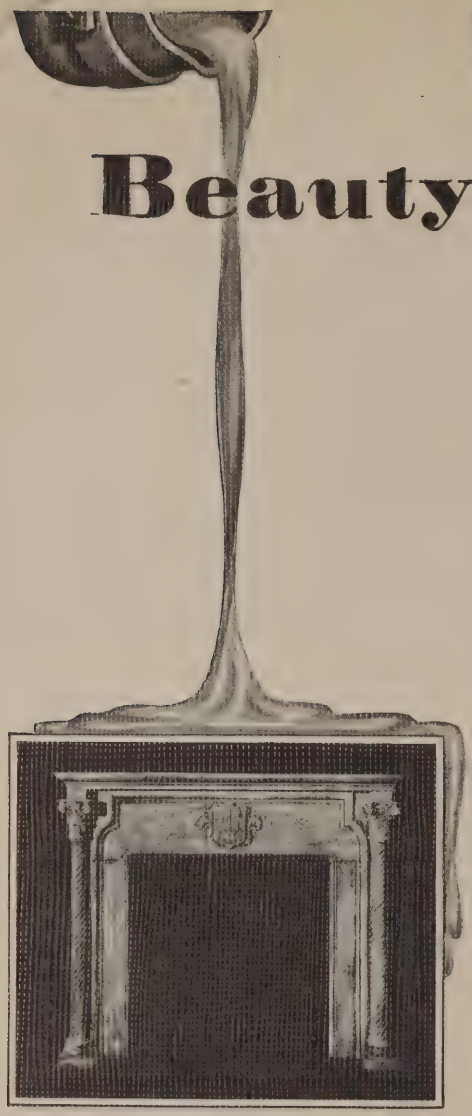

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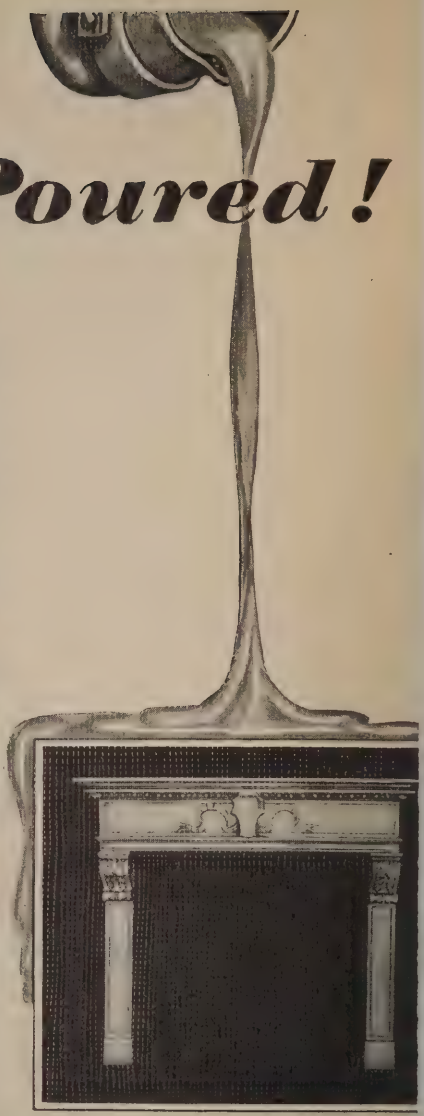

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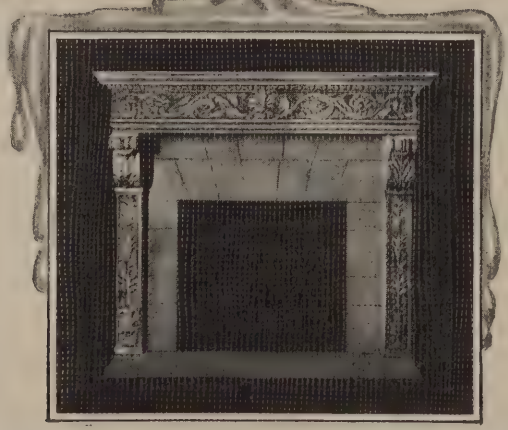

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BOOK DEPARTMENT

THE AMERICAN HOSPITAL OF THE TWENTIETH CENTURY

Reviewed by WALTER GRANT THOMAS

THE profession will welcome Edward F. Stevens' new and greatly enlarged edition of his book on hospitals. The subject is one which calls for expert advice, and those who have found themselves confronted with this very special problem have found, all too often to their sorrow, how difficult it is to get any exact information. The problem is so highly specialized, and information of the right constructive sort seems to be so lacking, that this revised edition is doubly welcome. The American hospital, with its close interlocking with the life of the community, is no longer the thing it was in the past. Few of the younger generation (should they become famous) will have log cabins to point to as birthplaces. Hospitals may soon begin the formation of a roster of those educators, presidents, etc. who have condescended to greet this world from their thresholds! To go to the hospital was a most disquieting affair within the memory of most of us. The hospital is now infinite in variety, and complete in the service of numerous types it renders to its particular community.

Study of a Multi-story Hospital
Charles Butler and Stevens & Lee, Architects

One is reminded, on glancing through Mr. Stevens' book, of the vast strides that the medical profession has made, and of the tremendous aids that are now available to the physician in furthering his efforts to cure. In fact, at times these would seem to be an embarrassment of riches; there is a fear that the mechanics of these vast institutions we have created may be and are sweeping away that personal contact between patient and doctor which is so necessary in the treatment of many ills. The rapid strides made in the treatment of special ailments and the development and perfection of special equipment, with the sales organizations that go hand in hand with them, make the problem of selecting, placing and operating of equipment a matter of unusual difficulty. A hospital may at first flash seem to be a very simple affair,—take a hotel and back up a few operating rooms to it, and there you are. That would be found to be a very poor solution of the problem; for one thing, it is not complicated enough,—not that a well planned hospital isn't simple and direct when well studied, but a hospital is much more than floors of private rooms with a few attachments. Its organization is most complex, and in its daily routine it must function smoothly; the problem of food service, the quiet and efficient handling of supplies, and the location and selection of proper equipment, make the planning of a hospital a problem far from one susceptible of standardization by the profession.

The architect who has to design a hospital will find a new and unusual problem on his hands,—he will find a new type of client to serve. He is working in a highly specialized field, and he will shortly realize, unless he has gone through the mill, how little he knows about hospitals. To such a man, Mr. Stevens' book will be found most useful. The factors controlling the problem are the usual factors of available funds, available land, plus type and size of community to be served, etc. If it is to be a hospital for special treatment, what services must it include? These and other multi-varied requirements so change the problem that an easy solution is out of the question. The architect will want information as to construction, as to the best type of floor, wall, trim, window and hardware. He will be swamped with appliances and equipment *ad nauseam.* It is important that he should know everything. He will be expected to advise on matters of equipment, mechanical and installation. He will become the final arbiter between divergent medical opinions. His experience will indicate that, though architects may be difficult to get along with, there are members of other professions equally difficult to convince! To all such Mr. Stevens' book will bring sustenance and material aid. We recommend it most heartily to architects.

Mr. Stevens takes up the modern hospital in a very logical way, and his chapters, beginning with the general considerations, take up the administration department, the ward unit in the general hospitals, the various other departments, from the surgical to the psychopathic, tuberculosis, research and so forth. There are also chapters devoted to the various kinds of hospitals,—such as the small hospital and the medical school hospital,—and then he takes up in considerable detail the service portions of the building, such as the kitchen and laundry,

GRADE SCHOOL BUILDINGS; BOOK II

IN no department of architecture have the last ten years seen quite the progress which has been made with schoolhouses, a class of buildings of the first importance, since they exert a strong influence upon their communities, and by their architectural excellence or the lack of excellence they elevate or lower the architectural standards of entire districts. Study of school structures, particularly at the hands of a group of well known architects, has resulted in their being given a high degree of architectural distinction and dignity in the way of design, while study directed toward their planning and equipment has led to their being practical and convenient far beyond what was regarded as an advanced standard of efficiency anywhere in America even a few years ago.

Kensington Schoolhouse, Great Neck, N. Y.
Wesley Sherwood Bessell, *Architect*

THIS volume, a companion to another published in 1914, records the results of endless study and experiment in different parts of the country, summed up and presented. By illustrations of exteriors and interiors, by floor plans and carefully written descriptions and articles by well known architects and educators, the present high standard of schoolhouse design is made plain, and these results which have been achieved by a few architects and school boards are thus made possible to all architects who are interested in schoolhouse design. The compiler has selected from almost 1000 exteriors and floor plans the school buildings to be illustrated, and the volume records "a process of innovation and elimination, namely, the introduction from time to time of features which have been deemed desirable and practical, and the elimination of things which, owing to changed school methods, are no longer required."

400 pages; 7¾ x 10½ inches
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and the mechanical plant considerations, such as heating, ventilating and plumbing. One chapter is devoted to details and finish, another to equipment, and finally a chapter is devoted to the considerations of remodeling for a hospital. The text is profusely illustrated with cuts of recent hospitals by various architects throughout the United States. The illustrations of plan arrangements are profuse and exceedingly instructive, since after all, the architect's greatest efforts will be to obtain proper plan arrangements. There are many illustrations and diagrams of the equipment for hospitals that should prove of great value to those engaged in the practical working out of the multitude of problems of construction and equipment. To the hospital architect, the problem seems to be just one detail after another as the plans progress beyond the first stages. The work in its former edition has come to be regarded as the authoritative guide to hospital architecture, and this revised edition makes it again available to architects, more valuable than ever.

THE AMERICAN HOSPITAL OF THE TWENTIETH CENTURY. By Edward F. Stevens. Third Edition. 549 pp., 7 x 10 ins. Price $15. F. W. Dodge Corporation, New York.

LOUIS XIV. By Louis Bertrand. Translated by Cleveland B. Chase. 366 pp., 6 x 9 ins. Price $5. Longmans, Green & Co., 55 Fifth Avenue, New York.

THE beginning of the greatness of present-day France may be said to have been made during the reign of Louis XIV. He mounted the French throne in his youth, and the 72 years of his long reign saw France firmly welded into unity, and with unity thus secured there came attention to the useful arts,—the arts of peace,—which placed France in the foremost rank among the nations of Europe, a position which, notwithstanding all subsequent mishaps and upheavals, France still holds.

Architecturally, the reign of Louis XIV was literally without parallel. "He re-made France in his own image. With his engineers and architects, he laid out public squares, planted the trees and flowers along the walks and esplanades, built a Hotel de Ville and a National Theater in the smallest provincial capital, and had water conduits installed in the streets, built monumental fountains everywhere, laid out roads, constructed fortresses, dredged harbors. The national museums are still filled with the work of his painters, his sculptors, his decorators. He went still further. He fashioned the souls, the feelings, the minds of his countrymen. Our souls are still both heroic and gentle, as were those of the men of his day, as was his own. There is the same social quality in our attitude toward life. We need to share our sensations, to be sorrowful or elated in common. We have also the same need to think clearly, methodically, rationally, that was characteristic of the great prose writers of his age. Our democratic conceptions of life come from him,—that conception of a social order open to all men of ability, in which personal merit takes precedence over birth. Our rules of social procedure are those that he and his courtiers established. In the best sense of the word, France remains the *salon* which he wished it to be, modeled after the example he set at Versailles. In this biography Louis Bertrand, distinguished novelist, brilliant historian and member of the French Academy, has revolutionized both the popular and the historical conceptions of Louis XIV. Louis emerges

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from the book not as a voluptuous despot, but as the creator of modern French civilization. The conception of him as a ruler who outdid and out-influenced Napoleon is startling, but so real and convincing that other portrayals of the Grand Monarch pale by comparison. Having prepared his material with the scrupulous care that the world has come to expect of French historians, Mr. Bertrand has written with the spontaneity of a novelist. Casting aside transitional historical methods, he reconstructs for us the king's personal life as if Louis were a contemporary character, picturing the gradual growth of a shy, bashful, timid boy hungering for affection into the kindly but inflexible despot who for more than half a century made all Europe tremble."

Even the works of history and biography which are most fascinating when read in their original text, frequently lose much when they are translated into English. A successful translator might be said to be, like a poet, "born and not made." Too much therefore could scarcely be said of the translation from the French which Mr. Chase has made. He has made a work most charmingly written into a work which when presented in an English dress possesses all the spontaneity and freshness which it possessed when it was presented in its original form.

AMERICAN COMMERCIAL BUILDINGS OF TODAY. By R. W. Sexton, 309 pp., 9½ x 12½ ins. Price $18 Net. Architectural Book Publishing Co., Inc., New York.

THIS volume is a survey of contemporary business buildings, stores and banks. It contains about 15 pages of text, including the foreword of pertinent comment by Ralph T. Walker, and 295 large pages of reproductions of plans, renderings and photographs from as widely separated subjects as the modernistic Chanin Tower in New York to the ultra-conservative Pacific Gas and Electric Building in San Francisco. The brevity of doctrine and the great variety of illustrations make the volume a convenient reference source where he who runs through it may read his own theories of the trend of architecture. He can see in American commercial building of today the dawn of an illumined tomorrow, where a national art shall rise resplendent, or where, if he be that kind of a reader, he can detect the itch for "something different" which drives the architect to forsake the standards which have satisfied for centuries our mingled race and to plunge into expression of Mayan or basaltic origin. In the chapter entitled "Skyscrapers" is to be found what the well dressed perspective is now wearing, —which make the Gothic seem to be almost child's play. In the chapter on "Private Business Buildings" the gamut of style is run from Egyptian through Spanish to the later Mail Order. The two last collections, those of Stores and of Banks are vividly contrasted; the first are gay, audacious and ephemeral; the second solid and, being traditional, express permanency.

Mr. Sexton has already published two similar volumes on contemporary design in the United States, the first a monograph on apartment houses, the second on theaters. To the office manager, overwhelmed with the ever-accumulating flux of architectural periodicals which, to remain serviceable, must be dismembered and filed according to subject, or else bound and carefully indexed, this clearly printed collection of nearly 500 plates offers

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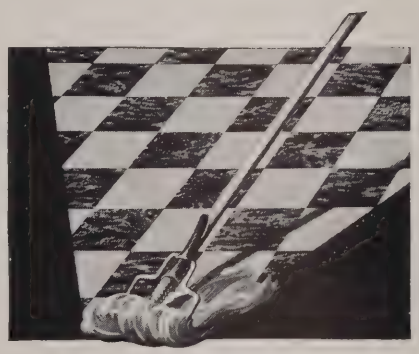

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THE GROWTH OF THE ENGLISH HOUSE. By Alfred Gotch. Second Edition, Revised and Enlarged. 214 pp., 5/2 x 8½ ins. Price $4.50. Charles Scribner's Sons, New York.

AS every student of architecture knows, the English home has been the product of centuries of evolution or development, and the study of these successive periods as they are now studied in retrospect or review constitutes in and of itself an absorbing subject. Mr. Gotch, whose name and achievements are known to all architects and architectural students, has been the author of many works upon a subject of which he has made a long and careful study. This particular work which now appears in a new and revised edition "has now definitely established itself as a standard work on its subject and has been in constant demand for a period of some 20 years. It is, in fact, one of the most readable and authoritative ever issued on the development of English domestic architecture, tracing as it does in a single volume its progress and growth from early feudal times to the dawn of the nineteenth century, which saw the termination of the Renaissance tradition. It is a graphic and absorbing narrative of which the illustrations, some 240 in all, form a unique pictorial record. They include general exterior views, interiors, features and details, doorways, windows, metalwork, decoration, gardens, plans, etc., and are taken from the finest photographs, drawings and old views. Advantage has been taken of the demand for a new edition to add or substitute a number of fresh illustrations, and to make various useful additions to the text of the volume."

HOW TO LETTER. By Maxwell L. Heller. Chairman of Art Department, Seward Park High School, New York. 64 pp., 5½ x 8½ ins. Price $1. Bridgman, Pelham, N. Y.

THE growing importance of lettering, not only in the architectural profession, but also in advertising and several more or less allied fields, lends particular value to means by which the student may learn to letter. Not only does Mr. Heller *tell* how to letter, but he *shows* how. His examples are clear, precise and definite. His text is simple, direct and convincing. This book was created for the beginning art student, but it is also a stimulant for the working artist and teacher. Unless one has attempted to do lettering, it is difficult to understand some of the matters which are dealt with by Mr. Heller. He explains the letter elements and their combinations; the spacing of letters; Gothic and Roman letters, both upper and lower case; the correct drawing of figures and price symbols, and other more or less closely related matters. The volume also deals with the use of the brush and the making of layouts, this probably for the benefit of students interested in several different forms of advertising.

"CHURCH BUILDING"—*By Ralph Adams Cram*

(A NEW AND REVISED EDITION)

THE improvement which has accompanied the progress of American architecture during recent years has been no more marked in any department than in that of an ecclesiastical nature. This has been due primarily to the rise of a few architects who by travel and study have acquired much of the point of view from which worked the builders of the beautiful structures which during the fourteenth century and the fifteenth were being built over all of Europe.

These architects have closely studied the churches, chapels, convents and other similar buildings in England, France, Spain and elsewhere, and the result has been a number of American churches of an excellence so marked that they have influenced ecclesiastical architecture in general and have led a distinct advance toward a vastly better standard. This improvement has not been exclusively in the matter of design, for plans of older buildings have been adapted to present-day needs, and old forms have been applied to purposes which are wholly new.

THE appearance of a new and revised edition of a work which is by far the best in its field records this progress. Mr. Cram, being perhaps the leader among the architects who have led this advance, is himself the one individual best qualified to write regarding the betterment of ecclesiastical architecture. The editions of this work of 1900 and 1914, which have for some time been out of print, have now been considerably revised and much entirely new matter has been added, which in view of the change which has come over ecclesiastical building of every nature is both significant and helpful.

Illustrations used in this new edition of "Church Building" show the best of recent work—views of churches and chapels large and small, in town and country, buildings rich in material and design and others plain to the point of severity, with the sole ornament in the use of fine proportions and correct lines. Part of the work deals with the accessories of the churches and their worship.

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ROGERS & MANSON COMPANY, 383 Madison Avenue, New York

THE EDITOR'S FORUM

AN ADDRESS BY THE PRINCE OF WALES TO THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

IN thanking you sincerely for the kind way you have received this toast, and for your hospitality to me tonight, I should like to allude to one or two of the many functions of the Royal Institute of British Architects and of its service to the nation.

The two paramount objects of this Institute are to look after, first of all, architecture; and secondly, but by no means least, architects. These functions, I consider, are of great importance to the whole of our community. We none of us can escape from architecture, whether it be good, or whether it be bad. We are surrounded by architecture; we are affected by it every day of our lives. If our architects are dull and uninspired, we are condemned to live in ugly, ill-constructed buildings; we are compelled to go about our daily businesses in drab and ill-planned cities, towns and villages. But if our architects can give us surroundings that are both good to look at and good to dwell in, the difference in our general well being and our outlook on life is wonderful. But fostering architecture is not merely a matter of acting, so to speak, as a watch dog over existing buildings which should be preserved, or over plans of proposed buildings which should never be erected,—though both those are important functions of the Institute. No, it demands also a very watchful eye on the interests of the architect himself. To do their best work for the nation and for the empire, your members must have their material interests considered and safeguarded, and above all they must be provided with opportunities. Ask the layman this question: "What is the first essential for an architect's work?" The layman will probably answer: "Bricks and mortar, and a piece of ground to put them on." If you were to ask even an Honorary Fellow,—and how lucky that I should have achieved this great position by acclamation and not by examination,—if you were to ask me, an Honorary Fellow, what the right answer is, I should say: "Clients." The architect differs from other creative artists in this great point; he cannot begin to create until the community gives him his chance. The painter can paint a picture,—it may be a very bad picture, but he still has the hope that some silly fool will come and buy it. The musician can start playing, on the chance of collecting an audience. But the poor architect cannot go out and build a town hall or a hospital, or even a cottage, without a definite commission to do so. He cannot even start building a pig sty or a reptile house or a monkey house, unless someone has a pig, or a reptile, or a monkey to put into it. The work of the architect is not the production of drawings, but the erection of buildings. And if this country wants beautiful houses, it must employ the best architectural designers. If it wants noble public buildings, it must give the collective genius of this great profession a free opportunity to compete for them,—otherwise it cannot exist.

Mr. President, you have been kind enough to say a word about the architectural policy pursued on the Duchy of Cornwall estates, but I can assure you that this policy has not been followed solely for the good of the general public; it is also a sound business proposition. We have always found that in the erection of cottages or blocks of flats, the cheaper method is by getting architects to design them rather than by adopting stock patterns. The architect is more economical and obtains his effects by trusting to good proportions rather than to unnecessary ornament. On the Duchy of Cornwell estates we have always found that a well designed and simple building invariably gives greater pleasure to those who live in it and,—still more important,—creates pride in the home. I would warn anybody who contemplates the erection of a building, however great or however small, of the fallacy that it is good policy to economize on the architect's fees. Speaking as a landlord, I can assure him that it is not.

The conclusion of an after-dinner speech is always a difficult matter; perhaps that is why so many speakers take such a long time in arriving at it. But the conclusion of my speech tonight is a very easy and pleasant matter. I have been allotted the privilege of presenting to Professor Ostberg the Royal Gold Medal for Architecture. The presentation of this medal is the highest honor that this country can bestow on any architect, and though the roll of those who have won it contains names which are famous all the world over, I doubt if there has ever before been more complete agreement on the choice of any recipient. By common consent, Professor Ostberg's masterpiece, the new town hall in Stockholm, is one of the greatest buildings ever produced by human genius, and I know full well that I am speaking on behalf of all British architects when I say we are very proud that our Gold Medal should be in his hands.

A CORRECTION.

AN article entitled "Structural Features of Some Modern American Churches" in the November issue of THE ARCHITECTURAL FORUM included, among other illustrations, two views of the "Riverside Church," New York. The credit lines accompanying the illustrations of this church, on pages 736 and 737, should read: "Henry C. Pelton and Allen & Collens, Associated Architects," instead of as printed.

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THE MEDICAL CENTER, NEW YORK

JAMES GAMBLE ROGERS, ARCHITECT

FROM A PHOTOGRAPH BY SIGURD FISCHER

The Architectural Forum

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER SIX

DECEMBER 1928

THE MEDICAL CENTER, NEW YORK

JAMES GAMBLE ROGERS, ARCHITECT

BY

C. CHARLES BURLINGAME, M.D.

EXECUTIVE OFFICER OF THE JOINT ADMINISTRATIVE BOARD OF THE MEDICAL CENTER

A GLANCE at the Medical Center as it stands today,—a towering group of skyscrapers, probably unprecedented in mass as applied to the needs of one medical undertaking,—gives to the discerning observer an immediate sense of the complexity of the problem involved in its design and construction. And if that observer happens to be aware that here in this group of buildings there are to be housed 12 units,—with common interests, but widely diversified in equipment and functions, all of which must be coördinated for a joint end,—he may be further impressed with the comprehensiveness of the task which confronted the organizers and architects of the Medical Center. That in spite of complexity of function, a decided unity of effect has been achieved in the group, from the architect's standpoint, is paralleled, from the physician's angle, by an intelligent unifying of all the branches of medicine,—in the three phases of treatment, teaching and research,—accomplished by the coöperative effort of the 12 units. As indicative of the stress and difficulty of the situation for both the Joint Administrative Board of the Medical Center and the architects, it should be kept in mind that while originally the coöperating units were only two,—the Presbyterian Hospital and the College of Physicians and Surgeons,—by the time the first of the new buildings was ready for occupancy, early in 1928, this number had been increased to 11, and is now 12, by the addition of the Vanderbilt Clinic; the Sloane Hospital for Women; the Squier Urological Clinic; the Presbyterian Hospital School for Nursing; the Stephen V. Harkness Pavilion for Private Patients; the School of Dental and Oral Surgery, and the De Lamar Institute of Public Health, both of Columbia University; the Babies' Hospital of the City of New York; the Neurological Institute of New York; and the New York State Psychiatric Institute and Hospital. With plans of organization thus continually in a state of flux and with policies of coöperation between the various units repeatedly under discussion, the architects had the responsibility of crystallizing and re-crystallizing ideas and designs to meet the changing situations.

In September, 1921 the Joint Administrative Board undertook an extensive survey not only of medical, dental, nursing, and other allied schools, together with the various types of hospitals and research laboratories as they exist in this country and Europe, but also of the study of the best current medical opinion and practice in general, and of what would be the requirements if these practices were ideally correlated by institutions. As tangible evidence of the investigation, several hundred plans with data were assembled from the principal centers of medical science. At the same time, as the various units entered into their agreements with the Medical Center, their histories, needs, future aspirations, and financial situations were studied in themselves, and as they affected one another. This period of preliminary study by the staff of the Joint Administrative Board lasted for two and a half years. Specifically, the mechanism of operation in regard to the actual plans of the greater portion of the Center was this: The data were classified by institutions, by departments and sub-divisions of departments; each room was named, numbered, its function, personnel, equipment and relationship to other rooms described or estimated as far as possible, the whole finally making up a building program of several volumes. In the meantime, as fast as this material was assembled it was turned over to the architects, who with this advice produced a set of sketch plans which they presented to representatives of the particular unit involved, for the usual criticism of detail. The plans as eventually evolved included space allotments for future buildings as well as for the expansion of the present structures. In January, 1925 the ground was formally broken, and the excavations were begun.

The general layout of the buildings, as determined by certain fundamental needs of the coöperating units, may be of interest. First there was the necessity of juxtaposition and coördination of related services for the College of Physicians and Surgeons and its main teaching field, the Presbyterian Hospital, which in turn uses the laboratories of the College for service to both patients and to nurses training. These joint requirements were met by connecting the 22-story Presbyterian Hospital building (which also houses the Sloane Hospital for Women and the Squier Urological Clinic) by a stem or axis building

Photos. Sigurd Fischer

THE MEDICAL CENTER, NEW YORK

JAMES GAMBLE ROGERS, ARCHITECT

Looking Southeast from Corner Ft. Washington Avenue and 168th Street. Left Foreground, Ash-hoist Building, Ambulance Garage; Center Foreground, Service Building; Right Foreground, Harkness Pavilion; Left Background, College of Physicians and Surgeons; Center Background, Presbyterian Hospital

THE MEDICAL CENTER, NEW YORK

JAMES GAMBLE ROGERS, ARCHITECT

Service Building (Left Foreground), College of Physicians and Surgeons (Left Background), Harkness Private Pavilion (Right Foreground), Presbyterian Hospital (Right Background)

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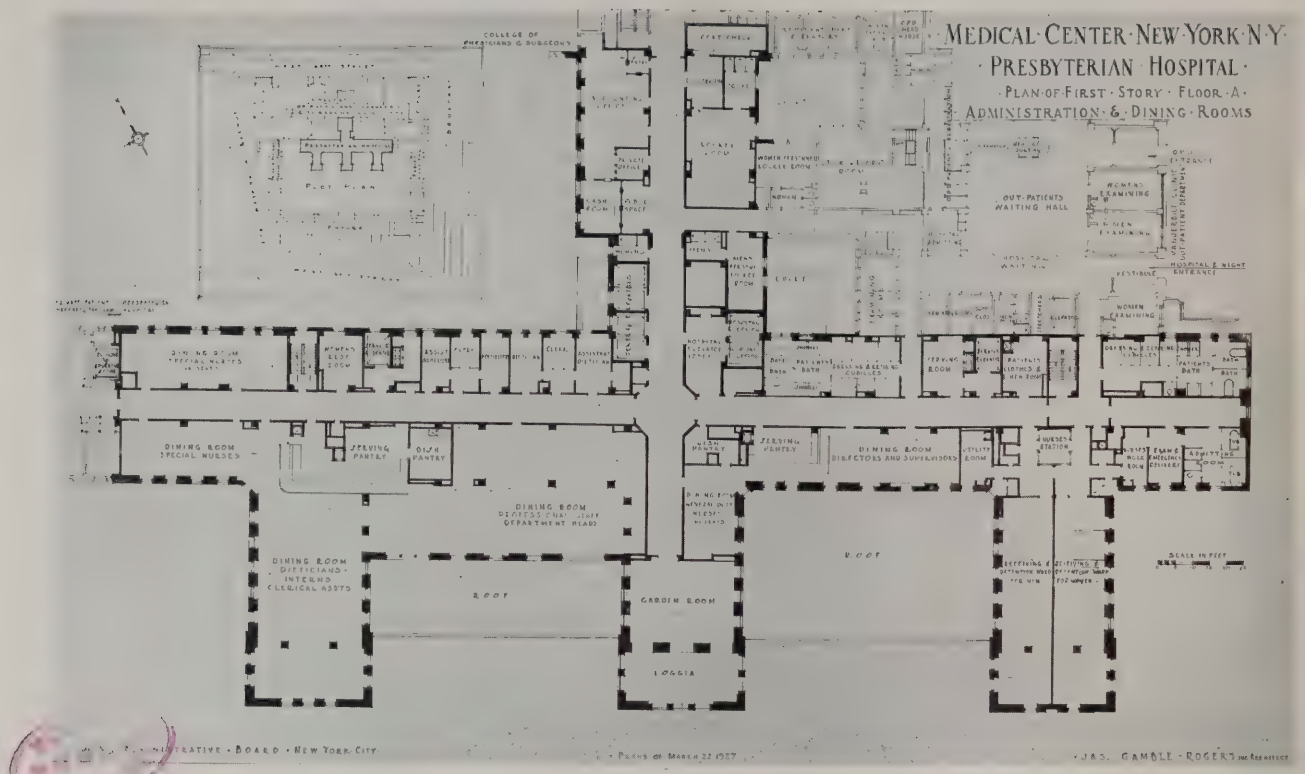

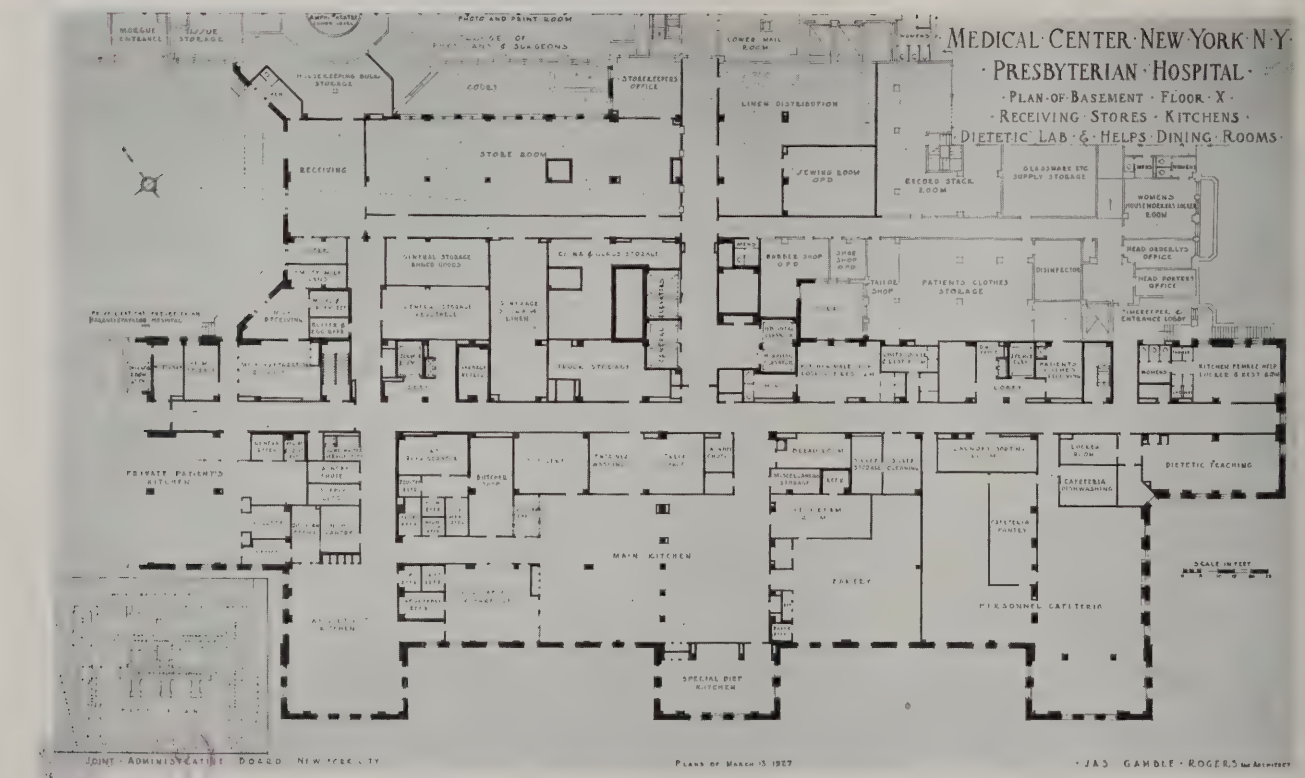

PLANS OF THE PRESBYTERIAN HOSPITAL
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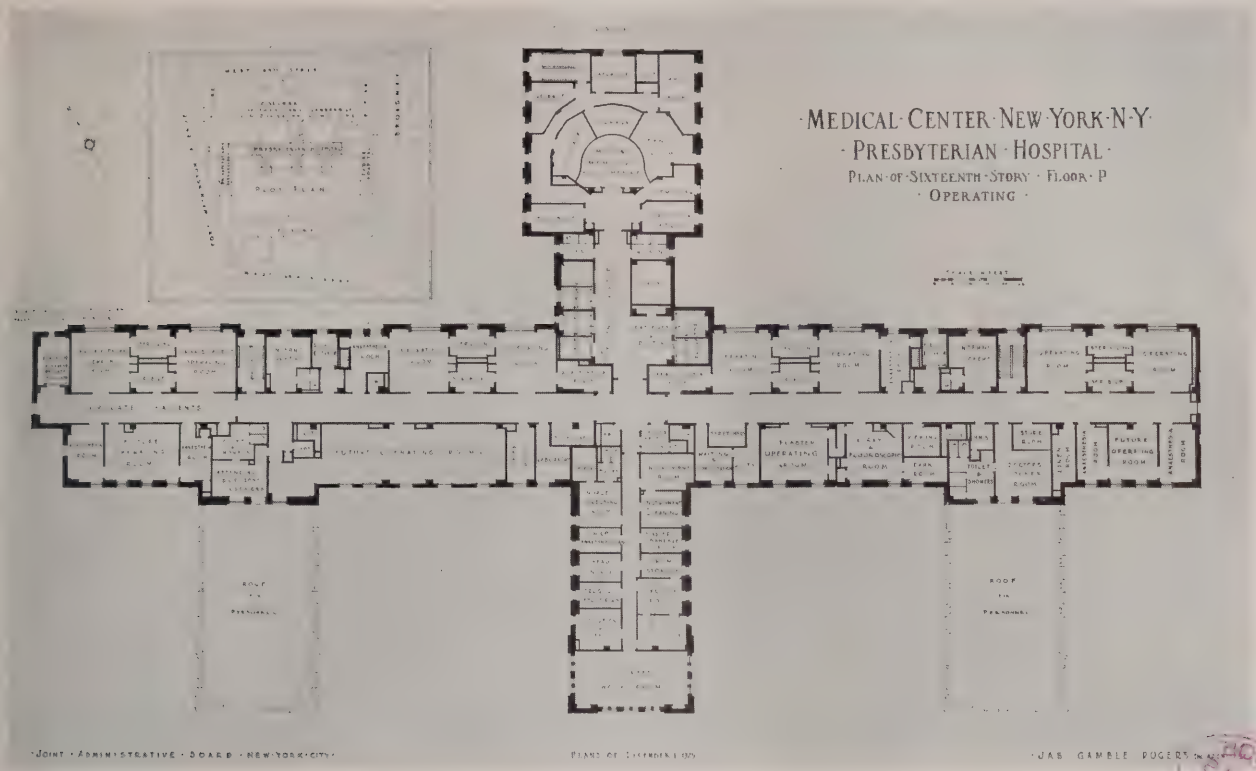

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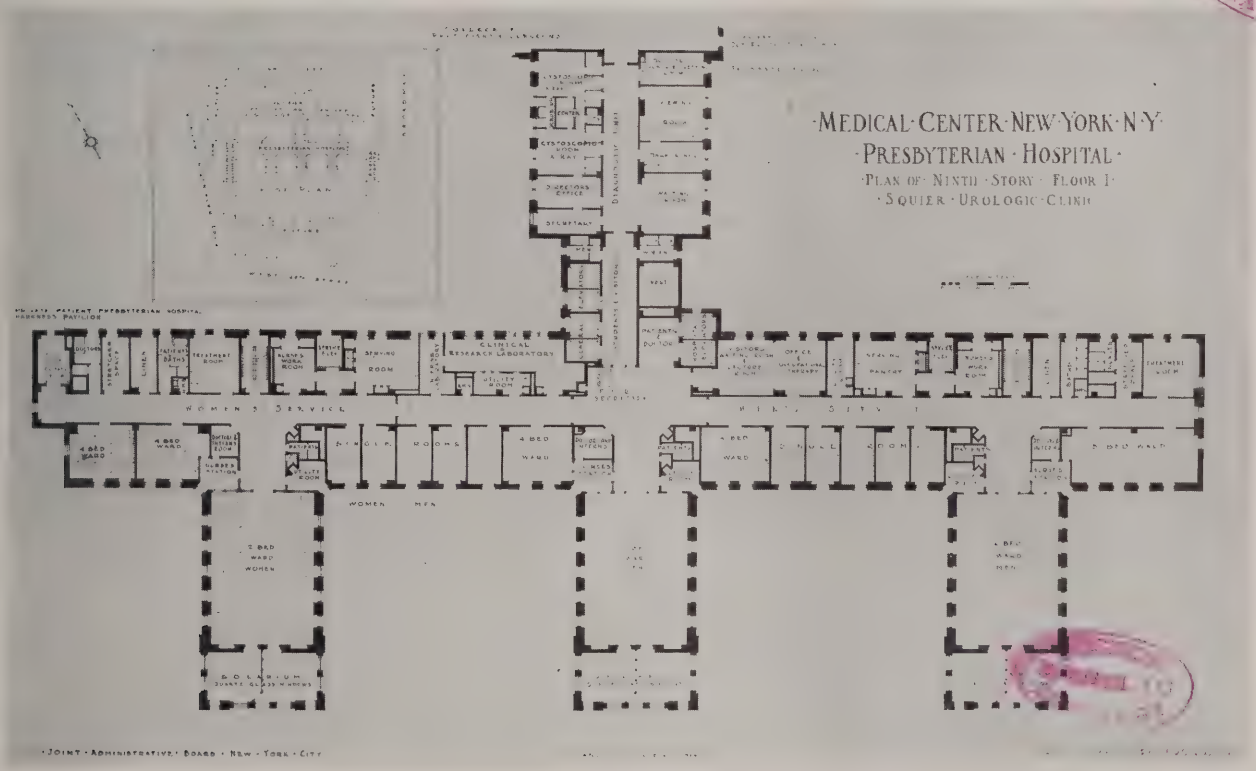

PLANS OF THE PRESBYTERIAN HOSPITAL
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Patients' Entrance (On Broadway); Presbyterian Hospital in Background; Vanderbilt Clinic and School of Oral and Dental Surgery (At Right); Babies' Hospital (At Left)

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Neurological Institute from Southeast (Or from Entrance to Harkness Private Pavilion)

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N. Y. State Psychiatric Hospital from the Northwest on Riverside Drive Front, (Sullivan W. Jones, State Architect, To Right, Anna C. Maxwell Hall, School of Nursing Residence (James Gamble Rogers, Architect)

THE MEDICAL CENTER, NEW YORK

JAMES GAMBLE ROGERS, ARCHITECT

Upper Stories, or Tower, of State Psychiatric Institute (Sullivan W. Jones, State Architect)

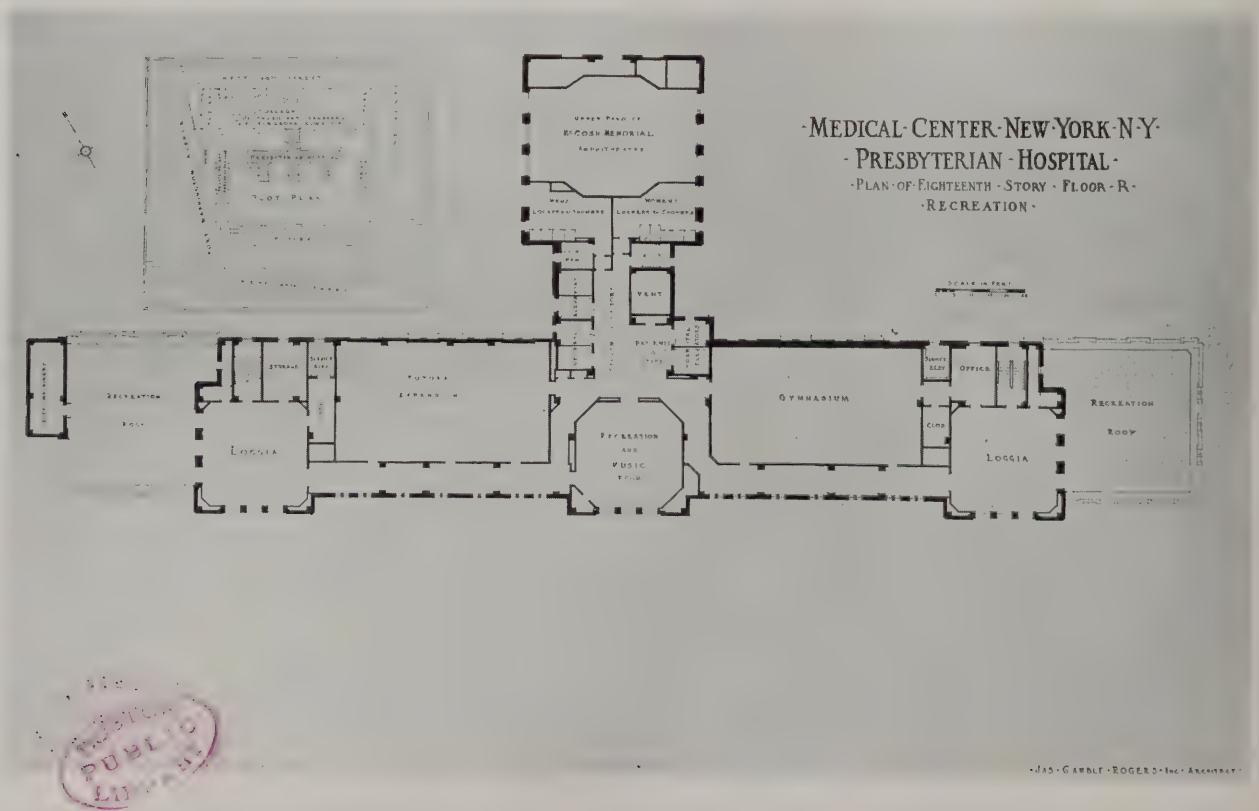
with the College. Communication on every floor is immediate, the laboratories and departments of the medical school being so far as possible on the same floors as the hospital departments with which they are most intimately associated, while the axis building is used for work which concerns both institutions.

It was also obvious that the Vanderbilt Clinic building (which houses on its three top floors the School of Dental and Oral Surgery) should directly adjoin both the medical school wing (to afford accessibility for students) and the main hospital group, for which it serves as an admitting unit, its entrance being convenient to lines of transportation. Contiguous to the Presbyterian Hospital building on the west, with direct access to its operating rooms, is the Harkness Pavilion for Private Patients, and correspondingly located on the east is the Babies' Hospital, still under construction. The orientation of the group is such that all patients' quarters,—wards or private rooms,—have sunny exposures, while areas to the north are used for service rooms, laboratories, etc.

In the cases of the Neurological Institute of New York and the New York State Psychiatric Institute and Hospital, the nature of their specialties and certain other considerations demanded a location apart from the main group. Consequently, they were placed on the opposite side of Ft. Washington Avenue, which divides diagonally the 20-acre site. In close proximity to each other because of their related work (both are still under construction at this date), they will be connected by tunnels to the main group. The Anna C. Maxwell Hall, the residence of the Presbyterian Hospital School for Nursing, is also dissociated from the other buildings to give the nurses an ideal residence site overlooking the Hudson, and to ensure a reasonable isolation from the scene of their intensive work with the sick.

Of special interest was the building problem of the Psychiatric Institute, in that its site is on two levels, with a sheer drop of 85 feet over a cliff and retaining wall. Making an asset of this situation, Sullivan W. Jones, the State Architect at that time, so planned that the entrance from its higher level (looking toward the main group) gives access to the ten upper stories devoted to research and out-patient work, while the ten lower stories, facing the river and with the natural rock as backing, offer the greater seclusion desirable for the mentally ill.

Skyscraper construction has been used for metropolitan hospitals in numerous instances, but never to the extent to which it is used at the Medical Center. Its time-saving possibilities and its other advantages for the sick have been developed to a new degree. With 22 elevators in the main group of buildings, some of these serving as a connecting link between two or more institutions, the availability of all branches of the medical service becomes a matter of seconds. This is only one instance of the application of a modern device to the special needs of the hospital. Because of the varying heights of the buildings, roofs and terraces have lent themselves particularly well to the purposes of recreation and rest

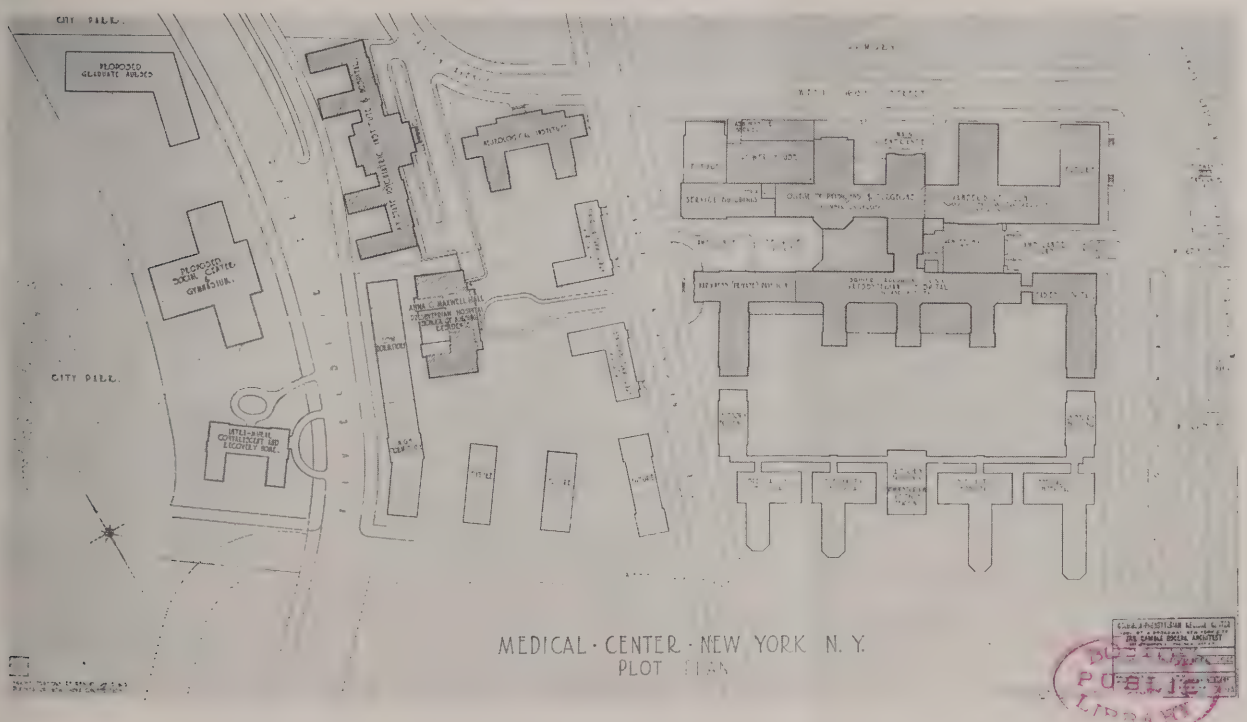


for convalescents, and the economy of ground space incidental to skyscraper construction has left room for a garden and campus which are of psychological as well as physical importance to the patients. These are, perhaps, from the architects' viewpoint, merely by-products.

Turning to the larger aspects of the achievement, the question may be asked: "What form has this building project assumed? Is it an adaptation of a recognized style of architecture, or is it something entirely new?" In making the fundamental designs, the architects were very closely governed by the exigencies of the various units. Furthermore, in an enterprise so vast, depending largely on private contributions, which, munificent in themselves, have nevertheless not been unlimited in proportion to the undertaking, economy was urgent. With these two factors directing and constricting the architects' plan, traditions and historic styles were abandoned. Ornamentation was reduced to the minimum. Even symmetry was neglected, except as it furthered the best planning of the interiors. The resulting irregular massing of skyscraper against skyscraper may be said to have, in its cumulative effect, the beauty which comes from austerity and simplicity,—from perfect adaptation to its end. So there has been created something new and outstanding in the field of design, while at the same time the profession of architecture has made a notable contribution to the world of medicine. In this connection tribute should be paid to James Gamble Rogers, architect of the Joint Administrative Board, and responsible for the main group of buildings; Henry C. Pelton and James Gamble Rogers, associated architects for the Babies' Hospital; and to Sullivan W. Jones, architect for the New York State Psychiatric Institute and Hospital.

Now to all of us who have been associated in the years of planning, there comes the hope that the efforts of the professions of medicine, architecture and building may have produced something more than a mere machine of relative perfection in its day, and that they have made possible an intellectual uniting of medical teaching, medical research, and care of the sick not accomplished heretofore. Then comes a wish that whatever step forward the Medical Center of New York may prove to be, it may be followed, as surely it must be, by other and greater advances in medical center planning in the future.

Editor's Note. As has already been explained, the Medical Center, which has attracted world-wide attention, consists at present of these units: College of Physicians and Surgeons of Columbia University; De Lamar Institute of Public Health of Columbia University; School of Dental and Oral Surgery; Presbyterian Hospital of New York; Presbyterian Hospital School of Nursing; Squier Urological Clinic; Harkness Pavilion; Neurological Institute of New York; Babies' Hospital of New York; Sloane Hospital for Women; and the Vanderbilt Clinic. The New York State Psychiatric Institute and Hospital, an institution owned and operated by the state, is also located at the Medical Center and will operate under an agreement with the Joint Board.



THE MEDICAL CENTER, NEW YORK
JAMES GAMBLE ROGERS, ARCHITECT
The Three Ward Wings from the Southwest

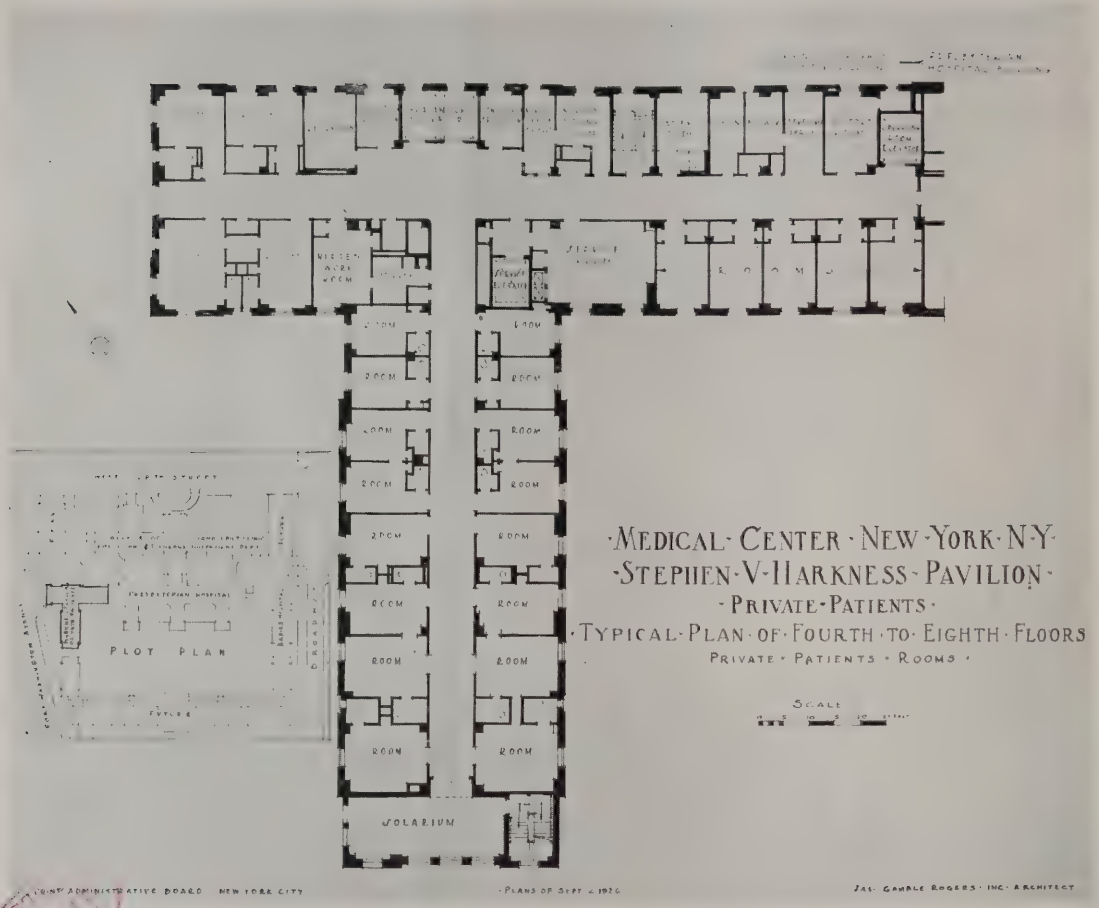
THE MEDICAL CENTER, NEW YORK
JAMES GAMBLE ROGERS, ARCHITECT
On the East Roof of Presbyterian Hospital, Looking West to Central Tower

THE MEDICAL CENTER, NEW YORK
JAMES GAMBLE ROGERS, ARCHITECT
Looking Up in an Angle of the South Court

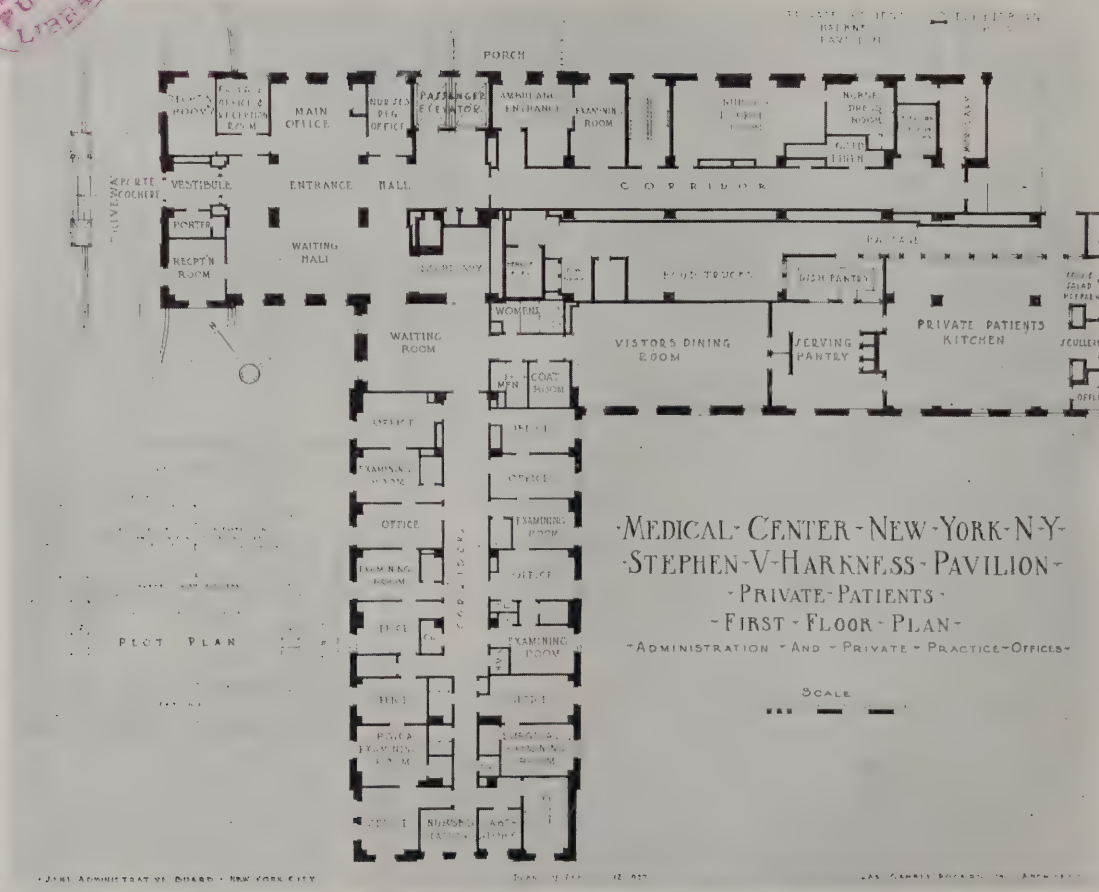
MUSIC AND RECREATION ROOM

McCOSH OPERATING AMPHITHEATER

THE MEDICAL CENTER, NEW YORK
JAMES GAMBLE ROGERS, ARCHITECT



POST PUBLIC LIBRARY



GENERAL VIEW

MAIN HALL

FRONT ELEVATION

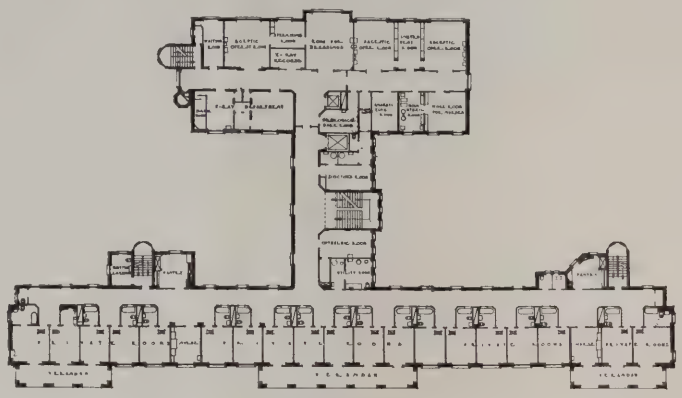
Plans on Back

THE COUNTRY HOSPITAL, SHANGHAI

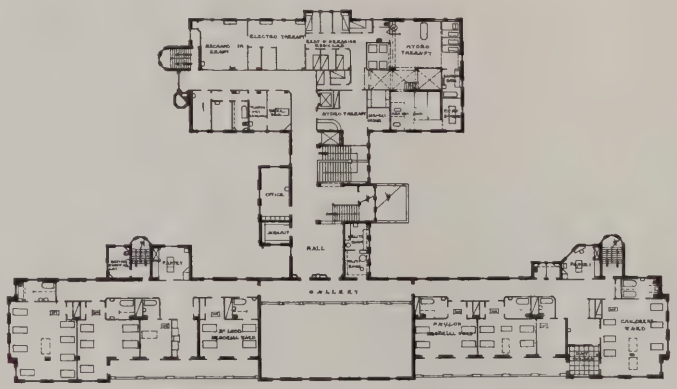
L. E. HUDEC, ARCHITECT

COST AND CONSTRUCTION DATA

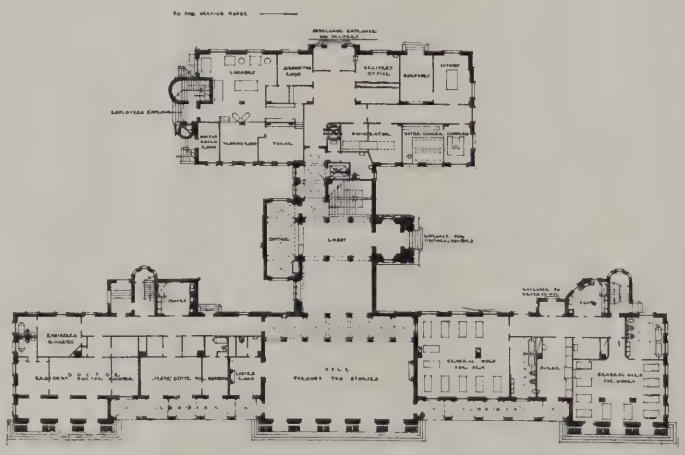
Date of Completion: July, 1926.
Type of Construction: Reinforced concrete.
Exterior Walls: Stucco and stone.
Floors: Various.
Windows: Metal.
Heating: Steam.
Cost of Building, with Equipment: $1,000,000.
Number of Beds: 150.



THIRD FLOOR



FIRST FLOOR



GROUND FLOOR

PLANS: COUNTRY HOSPITAL, SHANGHAI
L. E. HUDEC, ARCHITECT

MAIN HALL

MONUMENTAL STAIRWAY

THE COUNTRY HOSPITAL, SHANGHAI
L. E. HUDEC, ARCHITECT

GENERAL VIEW

END ELEVATION

MAIN ENTRANCE

Photos. Gabriel Moulin *Plans on Back*

HIGHLAND HOSPITAL, OAKLAND, CAL.

HENRY H. MEYERS, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: January 1, 1927.

Type of Construction: Reinforced concrete.

Exterior Walls: Reinforced concrete with terra cotta and stucco.

Roof: Partly tile and partly felt and gravel composition.

Floors: Cement, tile and battleship linoleum.

Windows: Wood except in operating rooms, where metal is used; double-hung and transoms.

Heating: Central plant, steam, oil fuel. Direct radiation, except in operating unit.

Cubage of Buildings: Present buildings, 4,800,000 feet. Completed group, 6,300,000.

Cubic Feet Per Patient: 7,000.

Cost of Building, without Equipment: Present cost plus estimated cost of completion, $4,250,000.

Cost Per Cubic Foot Completely Furnished: Based on completed group, 70 cents.

Number and Cost Per Bed: Present capacity, 456 beds. Capacity when complete, 900 beds. $5,000 per bed.

Cost of Operating Per Bed Per Day: At present, $4.40; when complete, estimated $2.50.

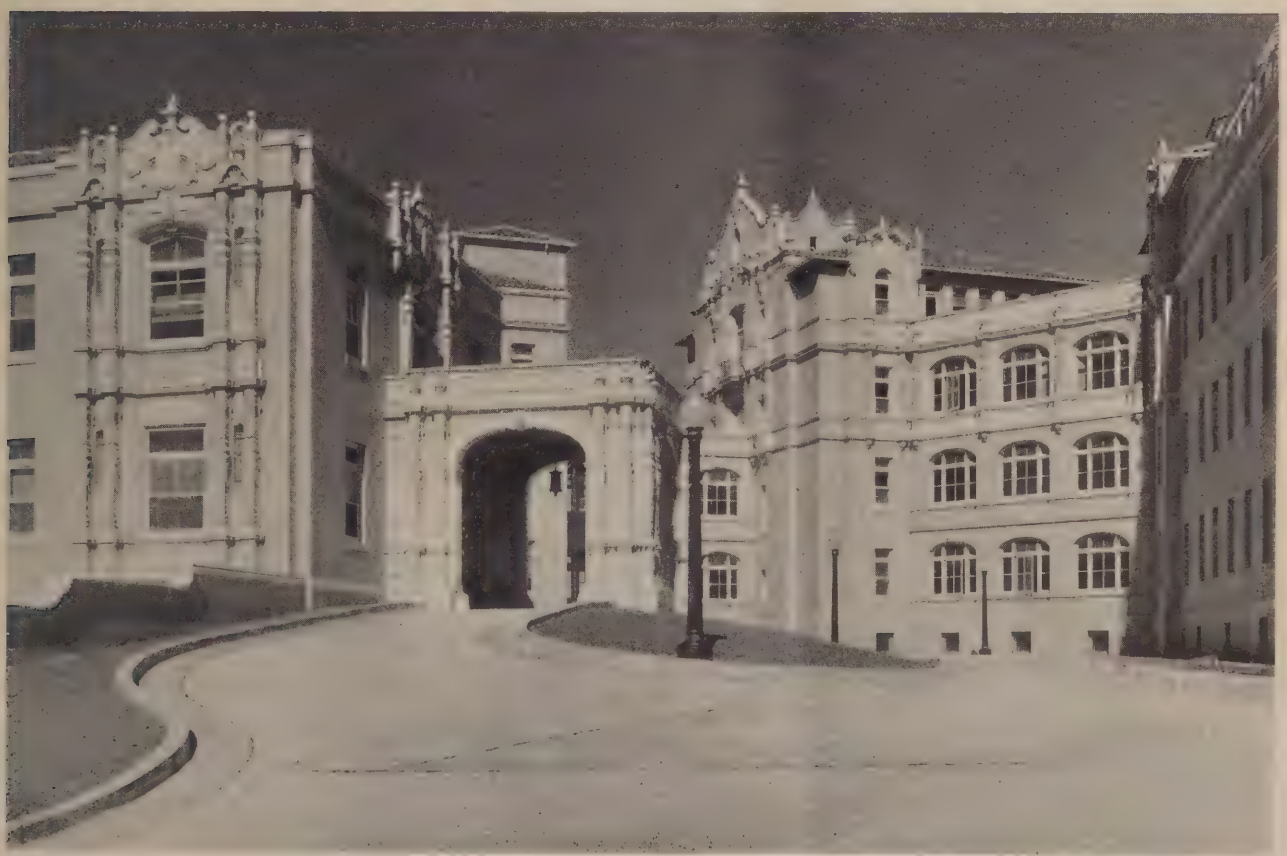
THIRD FLOOR

FIRST FLOOR

PLANS: HIGHLAND HOSPITAL, OAKLAND, CAL.

HENRY H. MEYERS, ARCHITECT

ADMINISTRATION BUILDING



Plot Plan on Back

AMBULANCE ENTRANCE

HIGHLAND HOSPITAL, OAKLAND, CAL.

HENRY H. MEYERS, ARCHITECT

PLOT PLAN

HIGHLAND HOSPITAL, OAKLAND, CAL.
HENRY H. MEYERS, ARCHITECT

LIBRARY

FRONT ELEVATION

Photos. Hilty Studio *Plans on Back*

GENERAL VIEW, HALIFAX DISTRICT HOSPITAL, DAYTONA BEACH, FLA.

CHARLES C. WILSON, ARCHITECT

STEVENS & LEE, CONSULTING ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: November 1, 1927.

Type of Construction: Fireproof.

Exterior Walls: Hollow tile, stucco.

Roof: Steel trusses, gypsum slab, tile, copper trim.

Floors: Reinforced concrete, ribbed joist, tile filler, tile finish.

Windows: Steel casements.

Heating: Vapor modulation, oil-burning, direct radiation.

Ventilation: Exhaust through fan in attic.

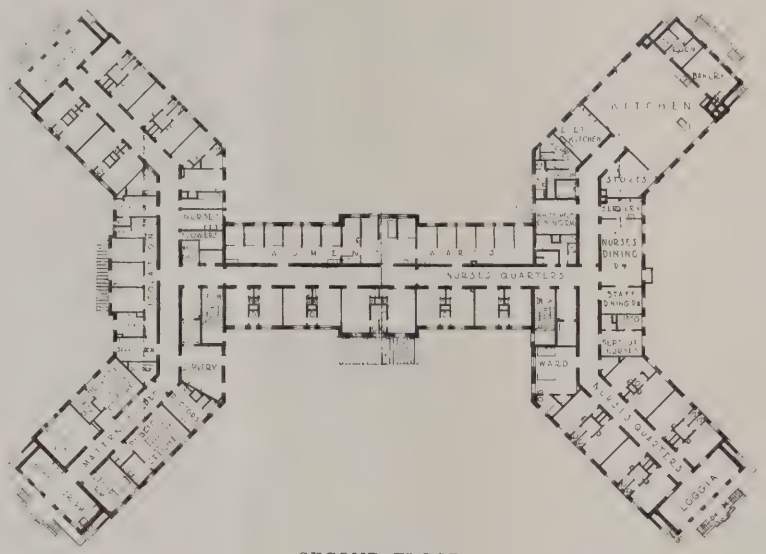
Cubage of Building: 828,930.

Cubic Feet Per Patient: Gross 7431, Minimum in room or ward, 960.

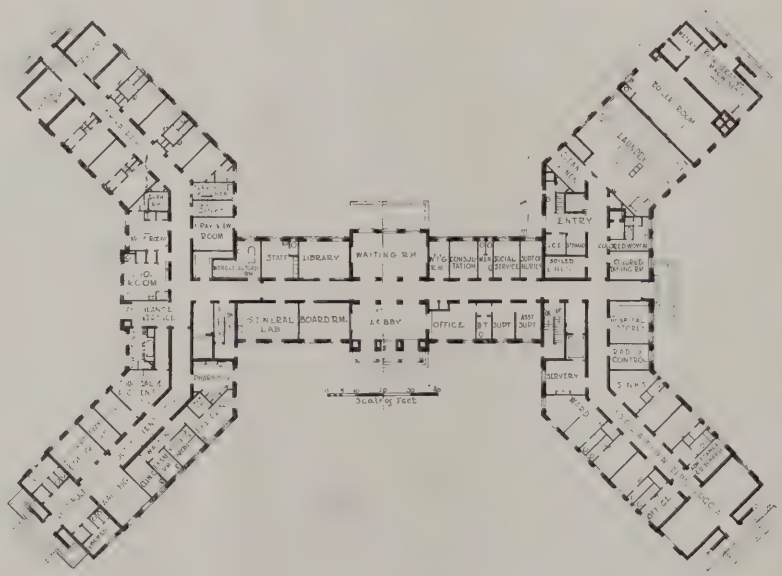
Cost of Building, Without Equipment: $519,373; or per cubic foot, 63 cents.

Cost Per Cubic Foot Completely Equipped: 69 cents.

Number and Cost Per Bed: 125 beds; cost per bed $4,595.



SECOND FLOOR



FIRST FLOOR

PLANS: HALIFAX DISTRICT HOSPITAL, DAYTONA BEACH, FLA.

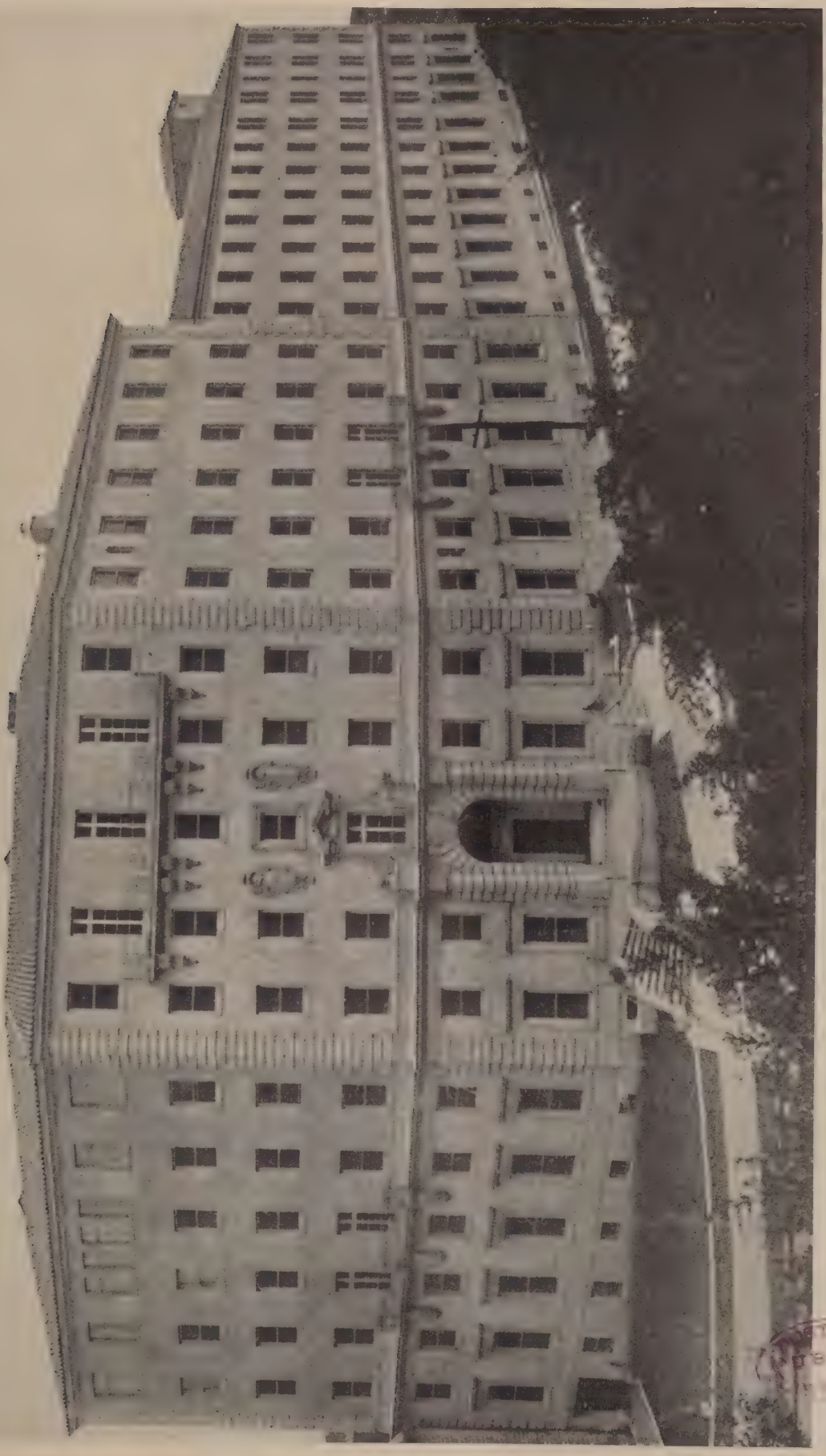
CHARLES C. WILSON, ARCHITECT

STEVENS & LEE, CONSULTING ARCHITECTS

BOSTON PUBLIC LIBRARY

MAIN ENTRANCE

ENTRANCE LOBBY, HALIFAX DISTRICT HOSPITAL, DAYTONA BEACH, FLA.
CHARLES C. WILSON, ARCHITECT



Plans on Back

ST. JOSEPH'S HOME AND HOSPITAL, SAN FRANCISCO

BAKEWELL & BROWN, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: May 3, 1928.

Type of Construction: Steel frame.

Exterior Walls: Curtain walls, reinforced concrete.

Roof: Concrete slab with tile roof.

Floors: Concrete with linoleum.

Windows: Double-hung, wood.

Heating: Steam heat.

Ventilation: For kitchen, toilets and operating rooms.

Cubage of Building: 1,500,000 feet.

Cubic Feet Per Patient: 7317. Actual air space per patient in patients' rooms varies from 1,000 to 2,012 cubic feet.

Cost of Building, Without Equipment: $899,000, including architects' commission.

Cost Per Cubic Foot, Completely Furnished: 65½ cents.

Number and Cost Per Bed Per Day: 205 beds at Average price of $4.

SECOND FLOOR

FIRST FLOOR

BASEMENT

PLANS: ST. JOSEPH'S HOME AND HOSPITAL, SAN FRANCISCO

BAKEWELL & BROWN, ARCHITECTS

MAIN ENTRANCE AND SOUTH ELEVATION

Plans on Back

CHILDREN'S HOSPITAL, CINCINNATI

STANLEY MATTHEWS—ELZNER & ANDERSON, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: November, 1926.

Type of Construction: Reinforced concrete columns, beams and girders. Floors, concrete rib construction.

Exterior Walls: Brick above water table and concrete block facing below.

Roof: Wings are roofed with promenade tile. Remainder 3-ply felt, pitch and gravel.

Floors: Corridors, wards, etc.,—rubber tile. Stairs, baths, etc., terrazzo. Tile, cement and wood elsewhere.

Windows: Wood double-hung windows except in chapel, where casement windows were used. Special steel windows in operating room.

Heating: Vapor.

Ventilation: Forced draft.

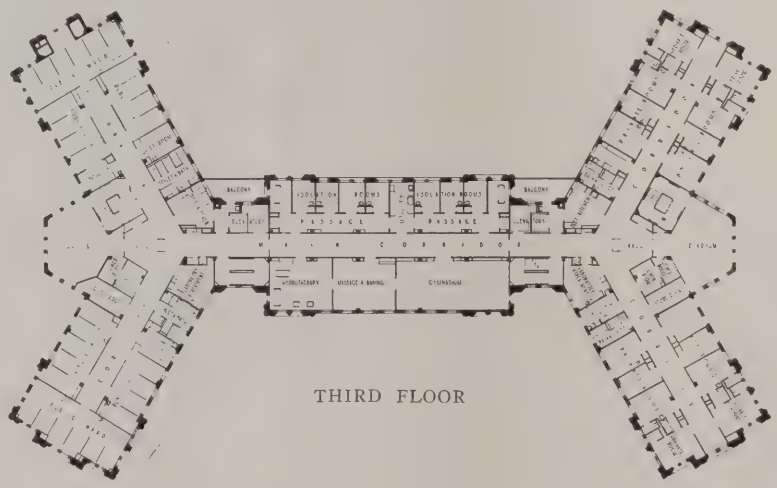
Cubage of Building: 1,400,000 feet.

Cost of Building Without Equipment: $998,500.

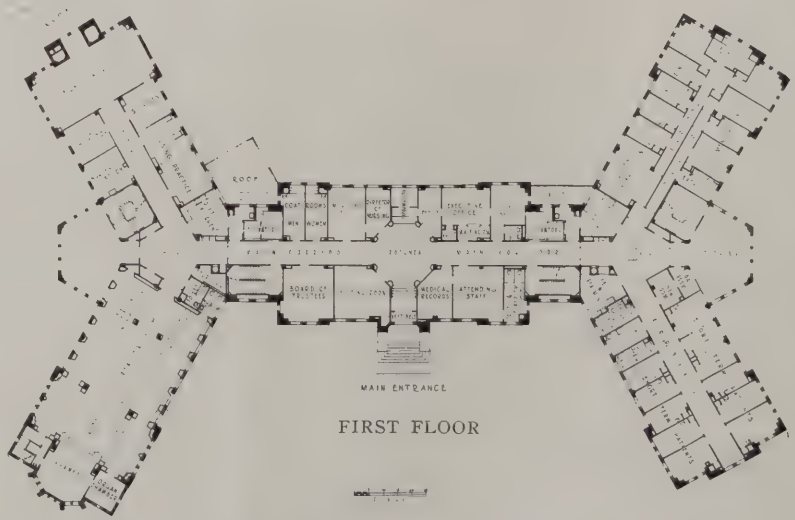
Number and Cost Per Bed: 152 beds at approximately $7,000. When completed, $5,500.

Cost Per Bed Per Day: $5.63.

Cubic Feet Per Patient: 6,542, based on 214 beds, when completed.



THIRD FLOOR



FIRST FLOOR

PLANS: CHILDREN'S HOSPITAL, CINCINNATI

STANLEY MATTHEWS—ELZNER & ANDERSON, ARCHITECTS

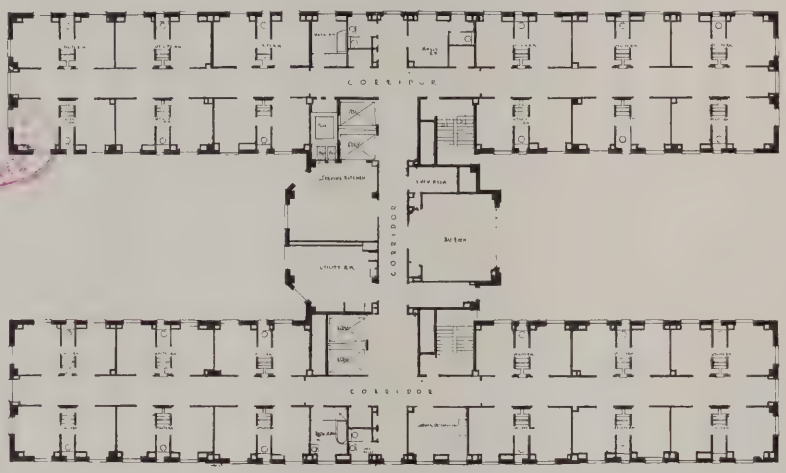
Photos. Wurts Bros.

Plans on Back

BETH ISRAEL HOSPITAL, NEW YORK
LOUIS ALLEN ABRAMSON, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1928.
Type of Construction: Steel skeleton.
Exterior Walls: Brick and back-up tile.
Roof: Tile.
Floors: Terrazzo and rubber.
Windows: Steel.
Heating: Modulating.
Ventilation: Fresh air supply and exhaust.
Cubage of Building: 3,220,000 feet.
Cost of Building Without Equipment: $3,700,000.
Number of Beds: 500.



FIFTH, SIXTH AND SEVENTH FLOORS

FIRST FLOOR

PLANS: BETH ISRAEL HOSPITAL, NEW YORK
LOUIS ALLEN ABRAMSON, ARCHITECT

GENERAL VIEW

MAIN ENTRANCE

ENTRANCE STAIRWAY

Photos. Luckhaus & Hoops

Plans on Back

HOLLYWOOD HOSPITAL, LOS ANGELES

ROBERT H. ORR, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: January, 1924.
Type of Construction: Class A, reinforced concrete.
Exterior Walls: Concrete filler.
Roof: Clay tile on concrete slab.
Floors: Linoleum on concrete slabs and joists.
Windows: Wood casements.
Heating: Vacuum steam.
Ventilation: Windows.
Cubage of Building: 719,250 feet.
Cost of Building, Without Equipment: $400,000.
Cost Per Cubic Foot, Completely Furnished: 75 cents.
Number and Cost Per Bed: 160 at $3370.
Cost of Operating Per Bed Per Day: $6.46.

PLANS: HOLLYWOOD HOSPITAL, LOS ANGELES
ROBERT H. ORR, ARCHITECT

GENERAL VIEW

ENTRANCE LOBBY

MAIN ENTRANCE

Photos. A. F. Crooks

Plans on Back

HURLEY HOSPITAL, FLINT, MICH.
THIELBAR & FUGARD, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: November 1, 1928.

Type of Construction: Fireproof throughout.

Exterior Walls: Reinforced concrete frame, brick and stone exterior walls backed up with hollow tile.

Roof: Composition.

Floors: Terrazzo, rubber tile, and mastic composition.

Windows: Wood frames and sash; steel casements.

Heating: Vacuum steam.

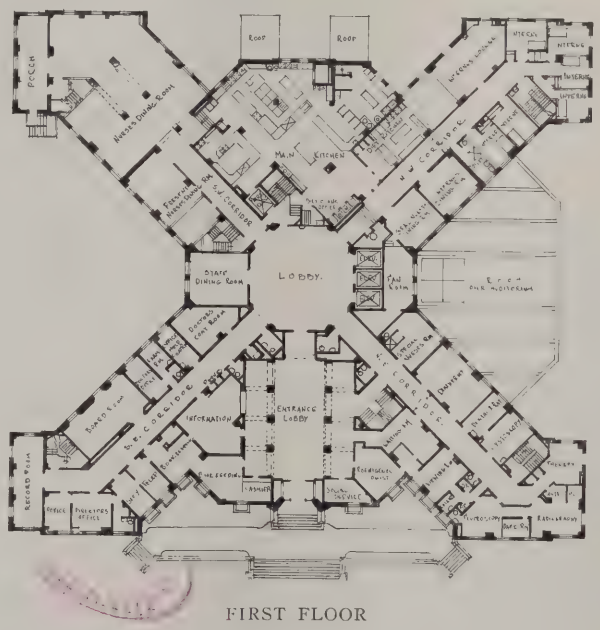
Ventilation: Exhaust for inside toilets, supply and exhaust for operating rooms.

Cubage of Building: 2,200,000 feet.

Cubic Feet Per Patient: 7285.

Cost of Building Without Equipment: $950,000.

Number Feet and Cost Per Bed: 302 at $3146.



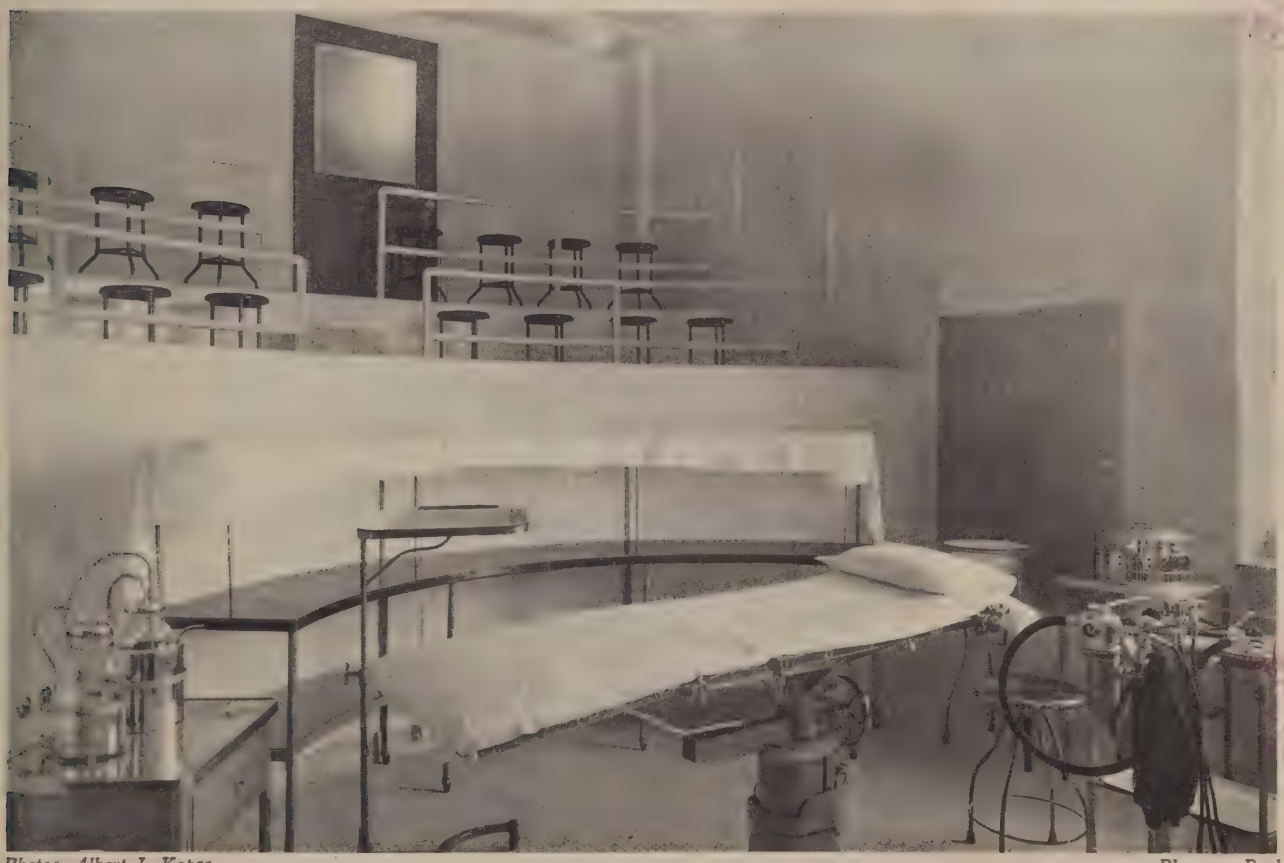
FIRST FLOOR

PLANS: HURLEY HOSPITAL, FLINT, MICH.

THIELBAR & FUGARD, ARCHITECTS

Photo. Weaver

GENERAL VIEW



Photos. Albert J. Kopec

OPERATING ROOM

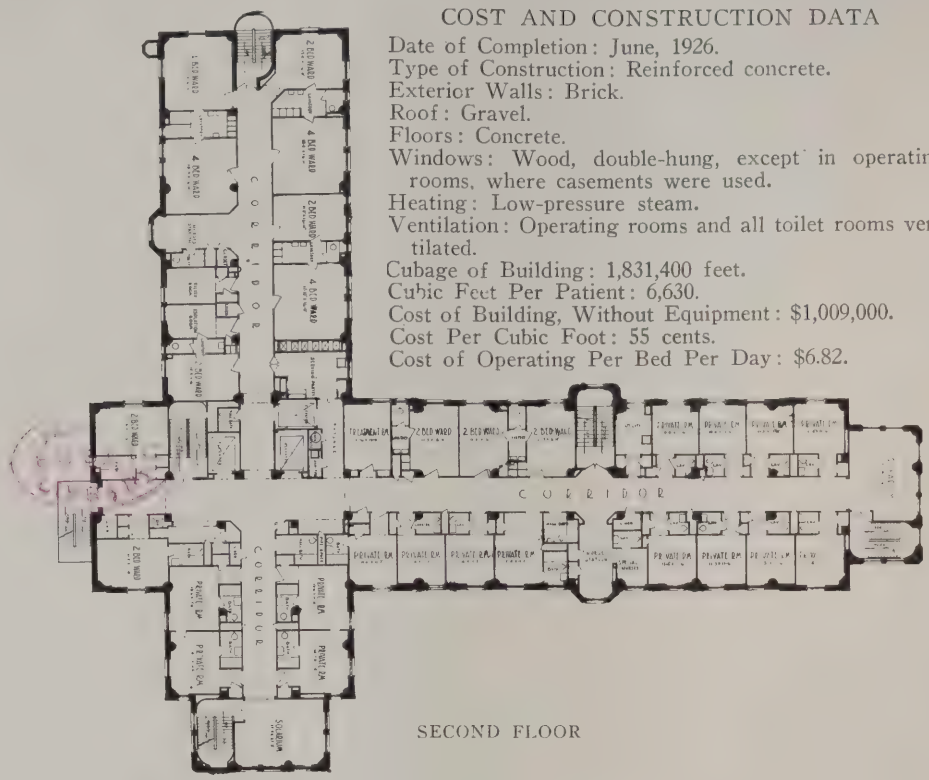
Plans on Back

CALIFORNIA LUTHERAN HOSPITAL, LOS ANGELES

WALKER & EISEN, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: June, 1926.
Type of Construction: Reinforced concrete.
Exterior Walls: Brick.
Roof: Gravel.
Floors: Concrete.
Windows: Wood, double-hung, except in operating rooms, where casements were used.
Heating: Low-pressure steam.
Ventilation: Operating rooms and all toilet rooms ventilated.
Cubage of Building: 1,831,400 feet.
Cubic Feet Per Patient: 6,630.
Cost of Building, Without Equipment: $1,009,000.
Cost Per Cubic Foot: 55 cents.
Cost of Operating Per Bed Per Day: $6.82.



SECOND FLOOR

FIRST FLOOR

PLANS: CALIFORNIA LUTHERAN HOSPITAL, LOS ANGELES

WALKER & EISEN, ARCHITECTS

ELEVATION ON FT. WASHINGTON AVENUE

MAIN ENTRANCE

CHAPEL WINDOWS

Photos. George H. Van Anda *Plans on Back*

ST. ELIZABETH'S HOSPITAL, NEW YORK

JAMES W. O'CONNOR, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: October, 1927.

Type of Construction: Fireproof throughout.

Exterior Walls: Brick facing, with 8-inch bonded backup tile, furred with 1½-inch split furring tile on inside.

Roof: Tile over roof laid into flashing blocks at all parapet walls.

Floors: Long-span reinforced concrete.

Finished Floors: Terrazzo floor and base throughout corridors, shower rooms, kitchens, etc. Maple wood flooring in patients' rooms.

Windows: Double-hung type, wood.

Heating: Vacuum steam heating system.

Ventilation: From kitchens and operating rooms only, —electric exhaust fans.

Cost of Building, Without Equipment: $739,285.79.

Number of Beds: Sixty private rooms; 40 beds in wards of 10 each.

SECOND FLOOR

GROUND FLOOR

PLANS: ST. ELIZABETH'S HOSPITAL, NEW YORK

JAMES W. O'CONNOR, ARCHITECT

BOSTON PUBLIC LIBRARY

GENERAL VIEW

Photos. Paul J. Weber

ENTRANCE HALL

Plans on Back

MAIN ENTRANCE

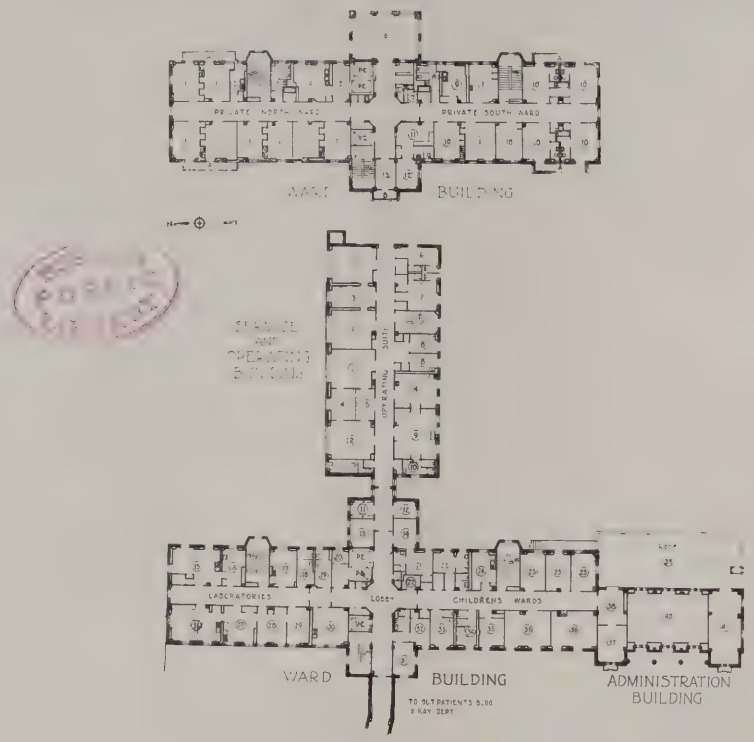
BETH ISRAEL HOSPITAL, BOSTON

DENSMORE, LE CLEAR, & ROBBINS, ARCHITECTS

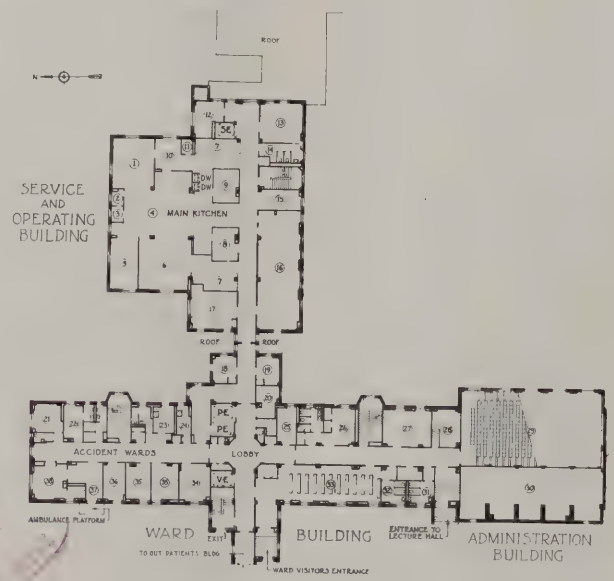
CONSTRUCTION DATA

Date of Completion: August, 1928.
Type of Construction: Brick, reinforced concrete.
Exterior Walls: Brick.
Roof: Concrete.
Floors: Concrete.
Windows: Some steel, some wood.

Heating: Steam.
Ventilation: Fans.
Cubage of Building: Ward building, 975,000; service building, 310,000; connecting corridor, 67,800; power house, 183,700; administration building, 158,000; out-patients' building, 381,000; nurses' home, 365,500.



SECOND FLOOR PLAN



GROUND FLOOR PLAN

PLANS: BETH ISRAEL HOSPITAL, BOSTON

DENSMORE, LE CLEAR & ROBBINS, ARCHITECTS

FRONT ELEVATION

Photos. Padilla Company

Plans on Back

HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES
REGINALD D. JOHNSON, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: April 19, 1927.

Type of Construction: Reinforced concrete.

Exterior Walls: Concrete with a plaster dash coat.

Roof: Covered with tile on pitched surfaces; composition for all flat decks.

Floors: Heavy battleship linoleum used generally, with tile; wood and terrazzo where special conditions occur.

Windows: Double-hung in patients' rooms and various types of casement and special metal sash in operating rooms, service portion, etc.

Heating: Direct steam radiation.

Ventilation: Electrically operated mechanical ventilating system.

Cubage of Building, 2,300,000 feet.

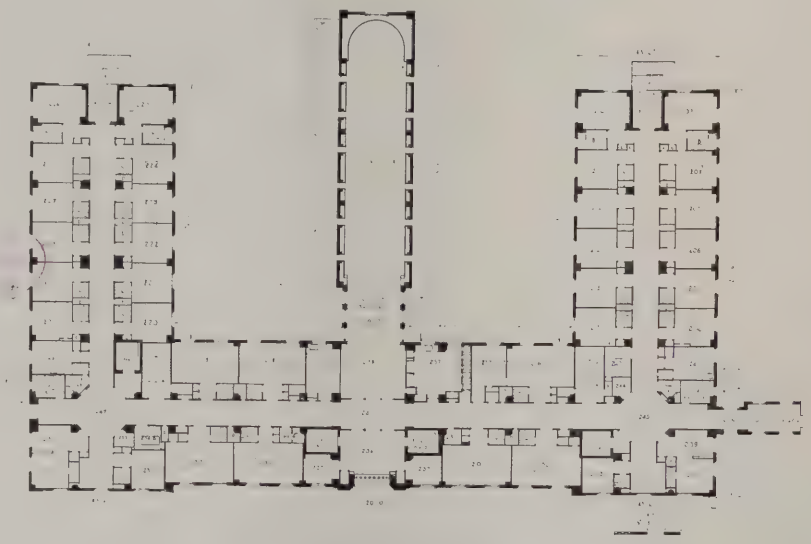
Cubic Feet Per Patient: 8,014.

Cost of Building, Without Equipment: $1,240,175.

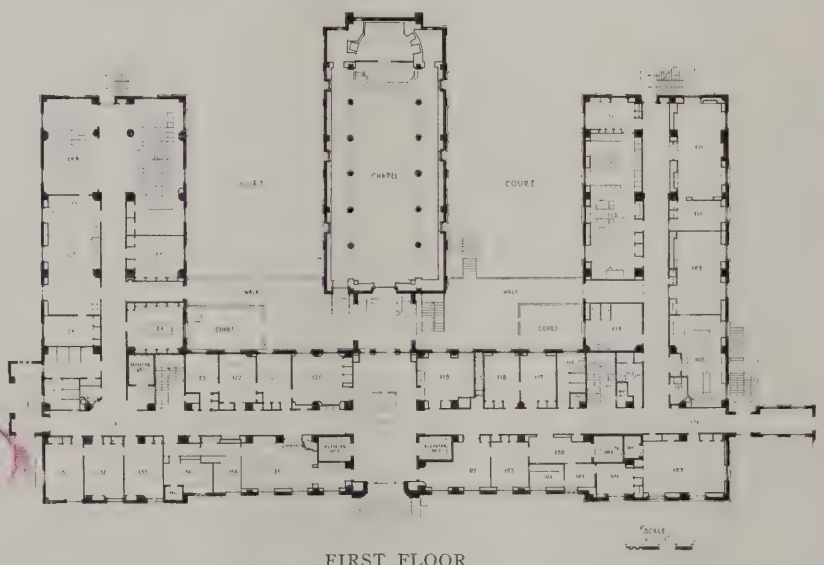
Cost Per Cubic Foot: 53 cents.

Cost of Building, Completely Furnished: $1,472,000 or 64 cents per cubic foot (not including chapel).

Number and Cost Per Bed: 287 at $5,126.



TYPICAL FLOOR



FIRST FLOOR

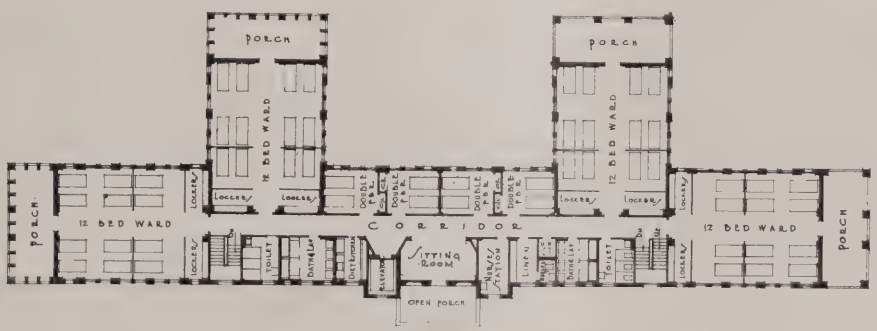
PLANS: HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES

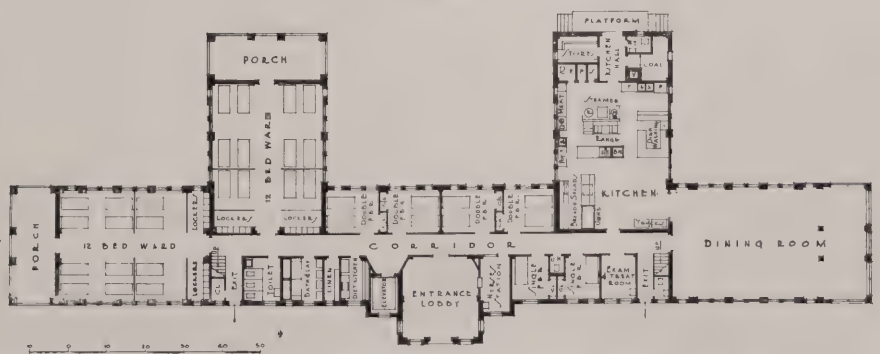
REGINALD D. JOHNSON, ARCHITECT

ENTRANCE

CHAPEL

HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES
REGINALD D. JOHNSON, ARCHITECT



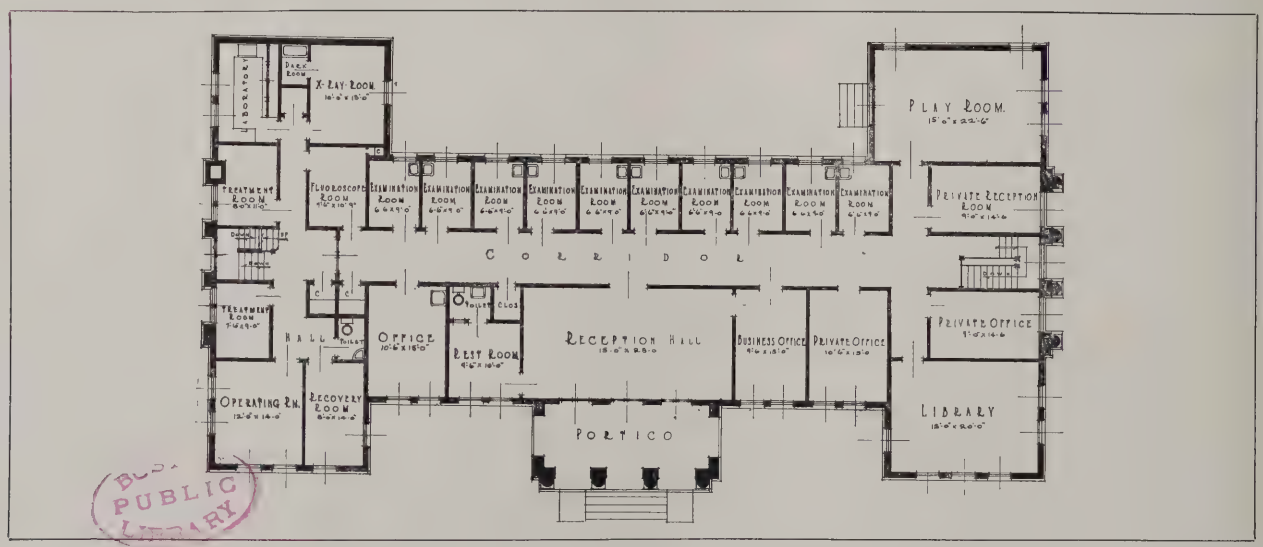


WARD BUILDING, WILLIAM H. MAYBURY SANATORIUM, NORTHVILLE, MICH.
STRATTON & HYDE, ARCHITECTS

BOSTON PUBLIC LIBRARY

Photo. Tebbs & Knell, Inc.

ENTRANCE FRONT



PUBLIC LIBRARY

CHILDREN'S CLINIC, MEMPHIS
GEORGE MAHON, JR., ARCHITECT

ALTHOUGH a one-story building, simple and direct in plan, the architects have created a design monumental and dignified in character. The rooms have high ceilings with air space above which keeps the temperature cool in summer. The use of brick in patterns and bands relieves the plainness of the stucco walls. Importance is given to the entrance portico by the use of engaged columns and a heavy entablature. Possibly the omission of this treatment and the substitution of brick in interesting panels between and above the openings of this portico might have contributed to a more modern spirit in the design. The planning provides for an excellent and economical disposition of available space.

HOSPITAL PLANNING AND ITS TREND

BY

FRANK E. CHAPMAN

DIRECTOR, MT. SINAI HOSPITAL, CLEVELAND; CONSULTANT, HOSPITAL ORGANIZATION, BUILDING AND OPERATION

AS a preliminary to a discussion of a program of development and an evaluation of hospital planning trends of the last few years, it is deemed essential to submit in general terms an outline of the demands that the planning of the general community hospital makes upon the individual responsible. It is, after all, the general community hospital that a large majority of the readers of THE ARCHITECTURAL FORUM are interested in. Proprietary hospitals have, of course, their place in the communal health scheme, but they are relatively few in number, and their problems are not as complex as those of the hospital designed to render general community service. The hospital building program is one of the most complex problems presented to the architect. This statement has ample confirmation by recognized authorities in the profession. By the large extent of mechanical costs in a hospital building a part of this complexity is accounted for, but this is by no means the real problem. The problem is the proper evaluation of the professional needs of the institution, related to the health service demands of the community. The modern hospital has ceased to be a self-contained unit. Its operation is a composite of all the requirements of the health program of the community. The individual responsible for planning must properly evaluate service needs and present to the community a finished plant, equipped within the limits of the building budget to meet the demands of all phases of the community health service.

The practice of medicine is itself becoming more and more complex. It is within the memory of many when the clinician needed no supplemental facilities to aid him in the diagnosis and treatment of disease,—when the percussion hammer (in many instances there were used instead the first and second fingers!) and the stethoscope were all that were used. That day is past. The modern practitioner of medicine relies no longer entirely on his own findings for a diagnosis. He confirms these clinical findings by the X-ray, the pathological, bacteriological, and chemical laboratory, by the electro-cardiograph, and by other services of precision, that are deemed essential to the modern practice of medicine. The equipment necessary to render these services is expensive, and the technical assistants require a high degree of training. Their proficiency in their work depends largely on there being a number of patients far greater than the average practitioner of medicine can expect. Therefore, except in isolated instances, the doctor has refrained from the development of these facilities as a part of his office equipment, and is relying upon the hospital to furnish them. Another phase is the recognition on the part of the attending physician, that scientific nursing care, proper dietary service and proper control of patients, can best be secured in the hospital. To summarize, the modern hospital is the health center of the community it serves. Its obligation to the patient and to the attending physician is to furnish every known means for the scientific diagnosis and treatment of disease. To meet that obligation, within the limited building budget of the average hospital, requires an intimate understanding of operating problems to allocate areas within the building to these services.

Selection of Site. Many readers will recall having been confronted with the necessity of properly using a site received as a gift, or a site purchased in advance of a program because it was cheap or because of expediency. It is true that with motor transportation, distances are not as important as they were formerly, but it is equally true that the proper selection of a site is exceedingly important to the future operation of a hospital. It is believed that a hospital should be closely adjacent to an artery of travel. If at all possible, it should not be located on but reasonably close to a street car line, for the convenience of visitors and the personnel of the hospital. Ideally, perhaps, from a standpoint of environment, the hospital should be located in the country, but such a selection could be made only without regard for other considerations that are of greater importance. In considering the environment, sources of air contamination must be eliminated. Adequate sewage disposal and water supply are prerequisites. The site must be sufficiently large to permit of a proper location of buildings, with adequate areas for courts. Plan the location of the first buildings thereon so that expansion of the institution may be made easily and at a minimum of cost. Evaluate the site as it relates to other hospitals in the community, to the end that there may be a reasonable geographic distribution of hospital facilities.

Type of Building. There are three general types of buildings to be considered: (1) The pavilion type; (2) the H-shaped, or modifications thereof; and (3) the multi-storied parallelogram. The pavilion type of institution has seen its ultimate development in European countries where ground values are relatively low and where operating labor costs are not as great as they are in America. It was conceived on the theory that isolation of types of disease demanded individual buildings. With our present understanding that disease may be controlled "inter-floor" as well as "inter-building," the philosophy of this planning is dissipated. When one further realizes that land values in the average community are high, that the excess cubage contained in necessary connecting corridors produces excessive bed costs, and that the maintenance cost of this type of institution is exceedingly high, it logically follows that we see a departure from use of the pavilion type of institution. Practically, the complete elimination of the pavilion type for general hospitals has been a definite

trend of plan of the best type in the last few years.

There are grouped together for discussion many modifications of the H-type design. There is no question that this general scheme lends itself to use very efficiently, from both an operating and a construction point of view. The size of the ultimate institution should govern, in large measure, the determination as to which of these general forms is to be followed. If the various major operating facilities may be properly located, and the nursing units so planned that visual control of individual patients' units is obtained (which can all be done), it is submitted that for the hospital of 150 beds or less this general type of plan is perhaps the best that can be adopted. It will please be understood that this is a general statement only. There is no such thing as a "best type" or "best plan." Each program presents a problem unique in itself. The multi-storied parallelogram is gaining increasing favor in large centers of population, where land values are high and where the community is accustomed to up-and-down travel to a degree which is not the case in small communities. With modern elevator equipment, vertical travel is much more economical than horizontal travel. The stacking of mechanical facilities of various types that must be duplicated in many places is more economical of construction than any other plan. Therefore, we see perhaps the greatest change in hospital planning in the examples of 20-, 25- and 30-story buildings developed for hospital service.

General Planning and Development. With an understanding that we are discussing the average hospital, and in no sense of the word attempting to present a formula for the planning of all hospital buildings, it is a fairly accurate general statement that the size and type of the hospital are predicated in large measure upon the character of nursing service to be rendered, and an evaluation on the part of the operating personnel of what constitutes an ideal nursing unit. The remainder of the institution must be planned around the nursing unit, and the location of all correlated facilities must of necessity be determined by their relation to it. With this as a premise, there is the necessity of determining the type of patient facilities to be furnished, and the size of the nursing unit. A statement as to what constitutes the ideal nursing unit cannot be made by reason of the many factors that enter into the determination of its size. Somewhere between 28 and 35 beds is the ideal nursing unit. Experience demonstrates that a charge nurse cannot efficiently take care of more than 35 patients, and that any number below 28 patients is not of sufficient size to engage her undivided attention. Accepting this, it is then necessary to determine the ratios of private, semi-private and ward beds that are to be provided.

Recent hospital developments have almost universally eliminated the large ward. Administrators recognize its inflexibility. Modern practice recognizes that the environment which characterizes large wards is not conducive to ideal medical practice. Furthermore, large wards interfere with many schemes of development unless they are put in separate buildings. We, therefore, see the development of ward facilities in four-, six- and eight-bed rooms, with an adequate number of quiet rooms immediately adjacent so that acutely sick patients may be cared for in these isolation rooms. This is a further definite trend of planning. The incorporation of ward, semi-private and private beds in the same nursing unit presents operating problems to be avoided if possible. Where at all possible, ward, semi-private and private beds should be kept in separate nursing units. It is recognized that this is not always possible. In general the patient will be happier, and the operating personnel will be happier, if these facilities are not combined. It is desired to submit the component parts of a properly planned nursing unit, with no thought that a general scheme of planning is submitted, but merely to act as a check list. The scope of this article will not permit of a detailed discussion of each of these facilities.

The Patient's Room. Sufficient be it to say that the minimum areas established in the building codes of most of our states, proper relationship of bed, window and door to each other, proper consideration of ventilation and illumination, are all essential.

Charge Nurses' Station. This is an item of planning that is very often given insufficient understanding. The location of the charge nurses' station will reflect itself for good or for evil in the service to be rendered to the patient, visitors and the attending physician. This station should be located approximately at the center of the nursing unit. It should be close to and control the entrance to the unit from the elevator and the stairs, for control of visitors. It should be so located that there is visual control of all of the rooms of patient occupancy. The location of the nurses' call annunciator at the station is not sufficient. It should be located reasonably close to the chart room, medicine cabinet and facilities provided for the congregating of nurses when they are not occupied with the care of patients.

Reception Room. Another facility, the importance of which is very often overlooked, is the reception room. Even at the sacrifice of a bed, in my judgment, this room should be provided. This facility should be provided in addition to any day room facilities that may be desired for patients. It is designed to provide privacy for those near and dear to acutely sick patients, so that they may not be compelled to sit in either the patient's room or the corridors. Reference has been made in a previous paragraph to the nurses' waiting room, medicine cabinet and chart desk. These facilities may be combined and be adjacent to the charge nurses' station.

Ward Serving Kitchen. Irrespective of whether centralized or decentralized dietary service is contemplated, there is a need of a ward serving kitchen planned to fit the type of service to be provided.

Utility Rooms. At this point we come to consideration of one of the pronounced trends of planning

in the last few years. We have heard a great deal about individual utility facilities for each patient, and have been presented with many plans for providing these units, some of them very meritorious. There is no desire to interpret the correctness or incorrectness of providing individual utility facilities for each patient or for each room of patient occupancy. Suffice it to say that whether this scheme or whether the scheme of providing central utility facilities for a given number of rooms is followed, it should be borne in mind that utility facilities must be located so that they are reasonably close to each patient's bed. It would seem proper to say that not to exceed 75 feet of travel should be necessary from a utility unit to any patient's bed. If individual units are planned, there is a need quite aside from these individual units for a central utility and work room, with facilities for sterilization and storage. There is no desire to submit a plan of this room. It is desired, however, to emphasize that seeming extravagance, by the inclusion of all facilities requisite for proper care, in reality is not extravagance, but is merely an assurance of a higher type of nursing service to patients, by providing facilities that expedite the service and minimize the energy necessary to render it.

No nursing unit ever had an adequate supply of storage facilities. This may be construed as an exaggerated statement, but it is believed that it can be successfully defended. Most of us who plan hospitals, no matter what our experience, realize the value of adequate supply closet space. There is submitted a list of these facilities for general supplies, —stretchers; treatment trays; linen room; flowers; maids' hopper facilities. May I emphasize the need for a properly planned flower closet? How many of us have gone through the corridors of a hospital at night and seen flowers from patients' rooms out in the corridor, subject to the abuse of such a practice!

Mention has not been made, and it is desirable that it be made, of the need for public toilet facilities for each nursing unit. The provision of these facilities is required by law in some states, but experience dictates that they should be provided in all institutions. There is a growing tendency to increase the proportion of rooms with baths. It is my judgment that such a trend should be discouraged. It not only increases the cost of construction, but it also adds a definite burden to the operating cost, all of which would be justified if the facilities were used by the patients; but as a matter of fact, most of these baths are for the patients' relatives and friends, and for nurses assigned to the care of the patients.

Operating Suites. It is too often true that the planning of the operating room is given a degree of study and an importance attached to this facility beyond the importance attached to other equally as necessary facilities in other parts of the institution. It should not be inferred that less care should be given in the planning of the operating room, but it is believed that there is a tendency to develop operating rooms beyond the real requirements of institutions. The type of staff that the hospital is to have must be determined in advance of planning the operating room. If it is to be a restricted group of men who are to do the operative work of the institution, then a relatively small operating suite may be developed. If, on the other hand, it is to be an open staff, then there immediately comes the need of the development of a larger number of individual operating rooms. Therefore, an attempt to establish a ratio of operating rooms to beds is impossible in a general article. It is desired to call attention to the fact that the efficiency of an operating suite lies very largely in the proper planning of the suite, and the allocation of an adequate area within the suite to work rooms, sterilizing rooms and other than strictly operating rooms. Surgeons are recognizing more and more that huge rooms are not requisite to good operative practice,—that quite the contrary is the case. Operating rooms in some institutions have an area of as low as 250 square feet. This, however, is believed to be a bit too small.

Another change in the thought of surgeons is the installation of skylights. They are depending more and more on properly installed artificial light, recognizing that its source is more constant and dependable. Without skylights, operating rooms need not be on top floors, but may be related closer to other facilities. Operating rooms for many years were planned as simply as possible, with the elimination of all fixed equipment in the room, on the theory that the simpler the room the more easily could surgical technique be maintained. We then saw a period of development in which built-in cabinets, sterilizing facilities, plumbing and items of a comparable nature were included in the room. This had its day, and now we see a trend toward the simplification of operating rooms again and a recognition that the operating room is not the place for the storage of supplies, sterilizers, wash-up sinks and items of this type. These details are now being located in separate rooms rather than in the operating room.

Prose and poetry have made the white hospital wall traditional, up to a few short years ago white was considered the only acceptable color to be used. Quite aside from the harmful effect on the patients (and that this harm has been definitely demonstrated is not subject to discussion) was the unfortunate effect that this hyper-aseptic atmosphere created on everyone. The acceptance of color and the introduction of warm color schemes into the institution, to my mind, is one of the main things which have come out of the last ten years of thought in hospital planning. There is no question that the white tile floor, walls and ceiling of the operating room could not have been more trying if they had been designed for that purpose. Restful colored tile dispels in a measure the exceedingly fearsome environment of an operating room for a patient. More important still, it increases decidedly the efficiency of the surgeon. It took surgeons a long time to accept this change and to agree to the installation of colored

Photo, W. C. Persons

Missouri Pacific R. R. Hospital, St. Louis
Charles H. Wray, Architect

operating rooms, but I question if any of them would go back to the old dazzling white rooms.

X-ray Facilities. The X-ray as a means of diagnosis and treatment is a relatively new thing in medical practice, but it has been developed to a stage where it is absolutely essential to modern hospital practice. A few short years ago if the hospital provided for Roentgenological service for fractures, it had fulfilled its obligation. Today the surgeon uses the X-ray machine no more than the internist or pediatrician. Diagnosis of diseases of the soft tissues is an integral part of the duties of the Roentgenologist. Machines for the treatment of certain forms of pathology have reached a marked degree of efficiency. Formerly it was the practice to locate the X-ray room in the basement, in some out of the way space that could not be used for anything else. This was good enough. Today the Roentgenologist's value and the demands made upon him by the clinician compel the location of the department at the center of the professional activities of the institution.

It is suggested that rather than install many pieces of apparatus in a large room, small cubicles be provided for each piece of apparatus, providing a flexibility of usage and an ease of operation that are not provided for in the first plan. Important items to consider in an X-ray department are proper ventilation, protection against the Roentgen rays, illumination, installation of supplemental wiring, and the furnishing of separate power service to the department. Close proximity to the surgery rooms is a prerequisite for certain types of treatment. The department should be properly serviced by elevators, in a multi-storied building, and have a waiting room and record facilities within the unit. Care should be taken to provide facilities for the storage of films and plates that will meet requirements of underwriters.

Department of Laboratories. Perhaps the most revolutionary change in hospital planning is the thought that is being given to laboratory facilities. This, of course, is due to the demands of the clinician for a type of laboratory service in keeping with an improved understanding of the needs of this type of facilities in the proper diagnosis and therapy of disease. It would be folly to develop laboratory facilities beyond the demands of the clinical staff, but wise planning will include a laboratory development in excess of the present-day recognized need of the staff, on the theory that the next few years will see an increasing demand rather than a diminution, and that without physical space allotted, the meeting of these demands will be difficult. As part of the wisdom of planning, it is suggested, as in the X-ray department, that small rooms for various types of service be developed rather than that an attempt be made to incorporate all of the facilities in one large room.

Electro-cardiograph Facilities. A change in thought in the last few years has eliminated use of special conduit systems and special systems of wiring for

Passavant Hospital, Chicago
Holabird & Root, Architects

the development of heart stations on nursing units, and has substituted the portable machine for bedside electro-cardiography. The central heart station need not be elaborate. The needs are not many, but if the clinician demands the service, it should be furnished.

Metabolism Room. There has been a tendency to place this room close to the laboratory facilities rather than close to patients' rooms. It would seem that it is better, and it is advocated to place this room near the latter. A certain amount of metabolism work can of course be done in the individual rooms, but it is believed desirable that there be a metabolism station where the major part of the work may be done.

No attempt has been made to list in detail here all of the professional and quasi-professional facilities requisite to modern hospital work, but enough has been presented to demonstrate why such a small ratio of the hospital's total cubage is occupied by patients. An intensive study of this ratio and an interpretation of its correctness has been made by a member of the American Institute of Architects (the only study of its kind that has ever been made, to my knowledge) of large groups of plans and has been presented to interested groups in the form of colored slides with computed ratios. This study presents in a very graphic way the complexity of hospital planning and proves that very seldom is more than 25 per cent of the total area of a building devoted actually to the bed care of patients.

Dietary Facilities. In this department we have seen another startling change in planning. The internist today recognizes the therapeutic value of properly prepared and balanced diet, with the result that the professional dietitian trained in food values and competent to interpret clinical needs is more and more taking the place of the steward or the chef, who formerly controlled the diet destinies of an institution. The importance of special diets has materially increased, with the consequent necessity for a larger diet kitchen. This diet kitchen should be located closely to the general kitchen, permitting of ease of supervision, but it should be a detached unit of operation. The development of centralized food service, designed to reduce to a minimum the handling of foods, is perhaps the most significant trend in operation in the last few years. This type of service immediately calls for a change in thought on the part of those planning the general kitchen. Therefore, before the kitchen plan can be evolved, it is necessary that there be had a very specific statement from the operating personnel as to the type of service to be rendered and the development of a plan around that scheme. Without this scheme of operation, no efficient kitchen scheme can be planned.

Storage Facilities. Just a few words to emphasize that the efficiency or inefficiency of a hospital rests very largely upon the provision of properly located and adequate storage facilities. An interpretation of what is adequate cannot be made in a general statement, but too much stress cannot be placed on it.

Administrative Facilities. Plan a large, commodious lobby, and then use every means possible in the development of a pleasant, cheerful atmosphere in that lobby. First impressions are always lasting impressions. It is desired to point out that the major heads of departments of an institution are handling problems that require privacy, and it would seem desirable to provide private offices for them. The telephone switchboard should never be located in the front office. It should be placed at a point where privacy may be assured. Do not overlook the necessity of providing adequate rest and cloak rooms for the attending staff, special nurses and female personnel.

Admitting and Emergency Rooms. With traffic increasing and the demands made on most of our hospitals for an increasingly large amount of emergency service, it is necessary to provide proper emergency facilities. An interpretation of the term "proper," again, is impossible, in a general statement. This paragraph is inserted to bring to the attention a need which is becoming increasingly great. It would seem logical that the admitting service of the institution should be adjacent to the emergency suite. This is not always possible nor desirable, but the suggestion is offered as one solution of the problem.

Housing of Personnel. A great many of our institutions follow, as a matter of expediency, the housing of nursing personnel in parts of the hospital. This is believed to be extremely undesirable, both from the standpoint of cost of building and from the standpoint of the effect upon the personnel. There is a great divergence of thought as to whether or not hospitals should house their personnel. It is not within the scope of this article to discuss this question, but it is desired to submit that the policy of the hospital must be established before the plan of development may be made, and that this policy having been adopted, such facilities as are deemed requisite for the housing of personnel may be provided. If it is desired to house various groups of a hospital's personnel, it should be borne in mind that recreational facilities, such as reception rooms, etc., must be provided for each group and sex, quite aside from any recreational or educational facilities that are provided for the student or graduate nurses.

It must be apparent that the presentation of a subject of this scope, within the restrictions of space allotted here, can be made only in general terms. It is hoped that the foregoing discussion has in a measure emphasized the complexity of the problem confronting the individual responsible for the development of a set of plans for a general hospital. These problems require an interpretative study of many phases, quite outside the realm of the architect's experience. Just as the ventilating engineer, the structural steel engineer, and other technical advisers are called into a study on structural problems, so should the operating point of view hold a very prominent place in the study of the type and size of building and the character of service to be included therein. This point of view cannot be too strongly emphasized. When one considers that efficiency of planning has a direct, continuous effect upon the type of service rendered, and when one sees the many instances in which hospitals have been developed without thought of operating problems, one cannot but feel that the architect must fortify himself, with every known means, to prevent inexcusable waste in construction and inexcusable lack of efficiency in the operating institution, the result of poor planning. The obligation to secure maximum efficiency is sacred. Institutions of healing touch the very foundations of our social structure more intimately than any other phase of social endeavor, with the possible exception of the Church. They are universally restricted in funds, for construction and for operation. Therefore, the conservation of funds will mean a more efficient health service and a better community.

The Duluth Clinic
W. C. Agnew, Architect

ST. VINCENT'S HOSPITAL, LOS ANGELES

JOHN C. AUSTIN AND FREDERIC M. ASHLEY, ARCHITECTS

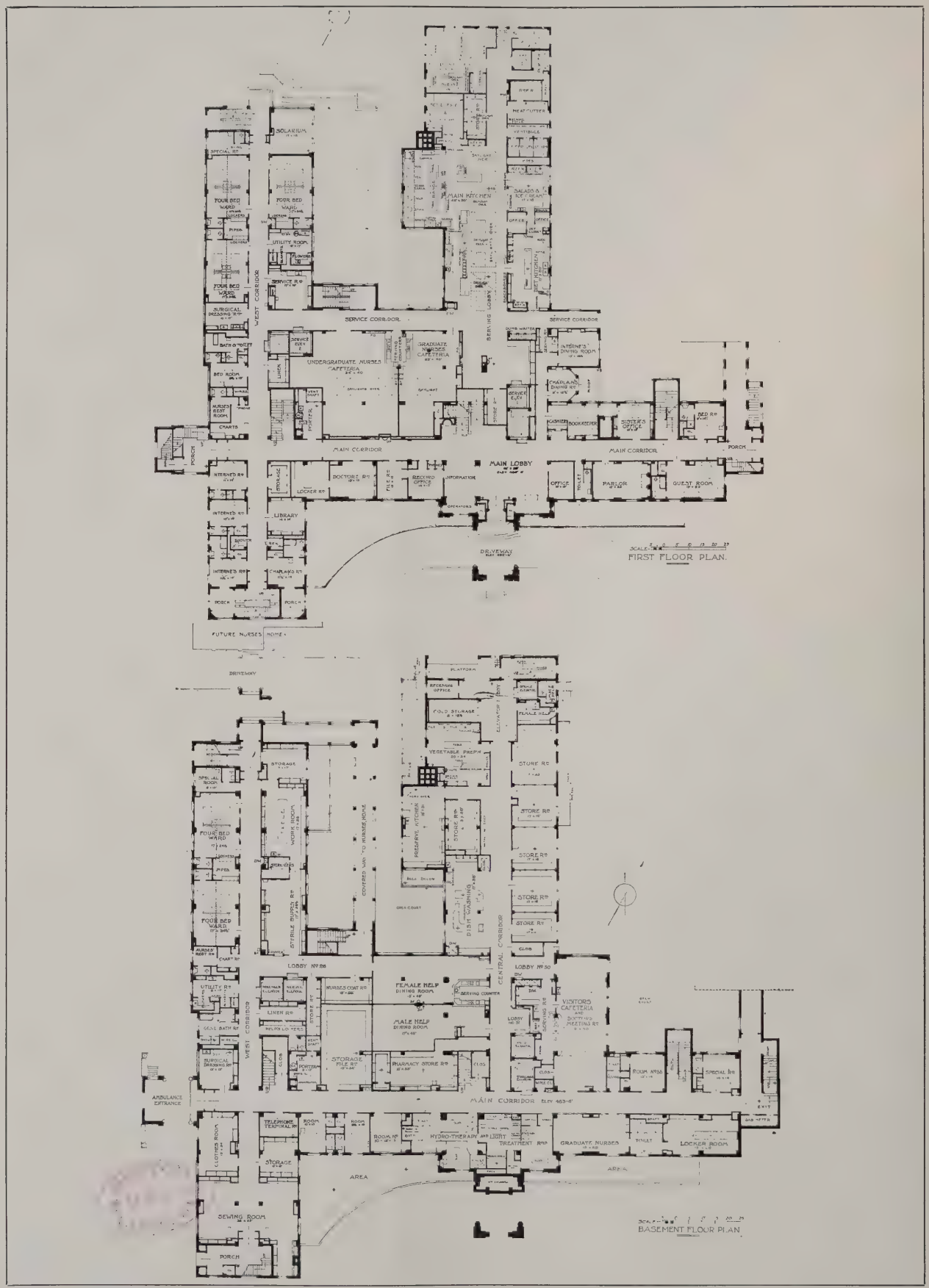
BY referring to the plot plan, it will be seen that St. Vincent's Hospital occupies a block of land, approximately 300 by 350 feet, and as planned consists of a group of five buildings, three of which are completed; the remaining two units will be commenced in the near future. The completed buildings are the main building, or hospital proper; the sisters' home containing chapel, dormitories and living quarters, and dormitory for the female servants; the boiler house and laundry, containing machinery for refrigeration, laundry, boilers and other accessories for heating, hot water apparatus and emergency generator for electric light. In addition to and connected with this building there are 30 rooms for the male servants. The nurses' home has not yet been built, but plans have been prepared for a five-story building containing 150 sleeping rooms, library, living room, waiting room, office, trunk room, classroom for class of 35, assembly room for 300, and small chemistry classroom. The outpatients' clinic building has not yet been planned.

All the buildings are of reinforced concrete construction and are fireproof throughout. Exterior wall surfaces are of cement stucco, finished with various textures. Terrazzo has been extensively used in the hospital and dormitory buildings. Floors of all rooms and corridors, bathrooms and lavatories, stairs and stair landings, the bases in rooms and corridors, around toilet stalls and on walls of dressing rooms are of this material; the only exceptions made are in the X-ray department and lavatory, where rubber tile has been used as a floor covering, and in the operating rooms, in which all floors and walls are covered with a special sanitary tile. Owing to the plastic condition of terrazzo during its application, many very practical uses were devised,—for instance, the use of a continuous ledge formed on the base along one wall of every patient's room to prevent the bed from coming in contact with the wall. This may seem a trivial detail, but in the maintenance of a hospital it is really of considerable importance. Again, instead of using marble or metal for window stools, terrazzo was employed and found to be a very practical substitute. Most of the plastering in the buildings is of lime and Keene's cement. All surfaces are troweled smooth, and all projections and angles neatly rounded to ¾-inch radius. All interior door frames are of steel finished with lacquer, corners are rounded to a 2-inch radius, and the usual trim has been omitted. Door stops extend to within 3 inches of the floor, and the terrazzo base is carried around the jambs, making continuous sanitary surfaces with round corners, which are easily cleaned.

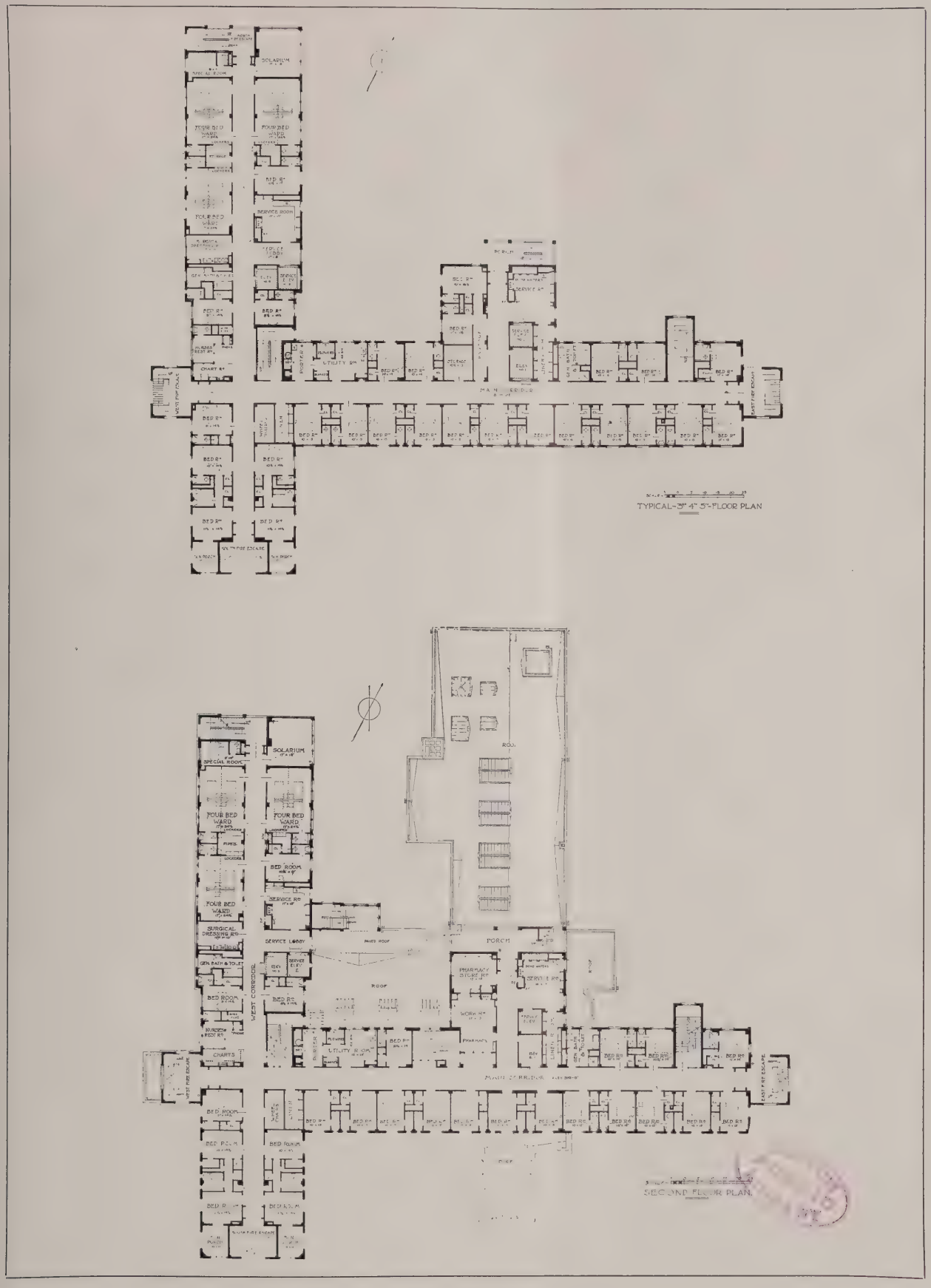
All doors are of the "flush" type, veneered with quarter-sawed white oak, stained and lacquered. A few of the patients' rooms have baths attached, but where these are lacking, toilet compartments have been provided. The equipment and appointments of these toilets and bathrooms are rather interesting

Photos. Moss

St. Vincent's Hospital, Los Angeles
John C. Austin and Frederic M. Ashley, Architects



PLANS: ST. VINCENT'S HOSPITAL, LOS ANGELES
JOHN C. AUSTIN AND FREDERIC M. ASHLEY, ARCHITECTS



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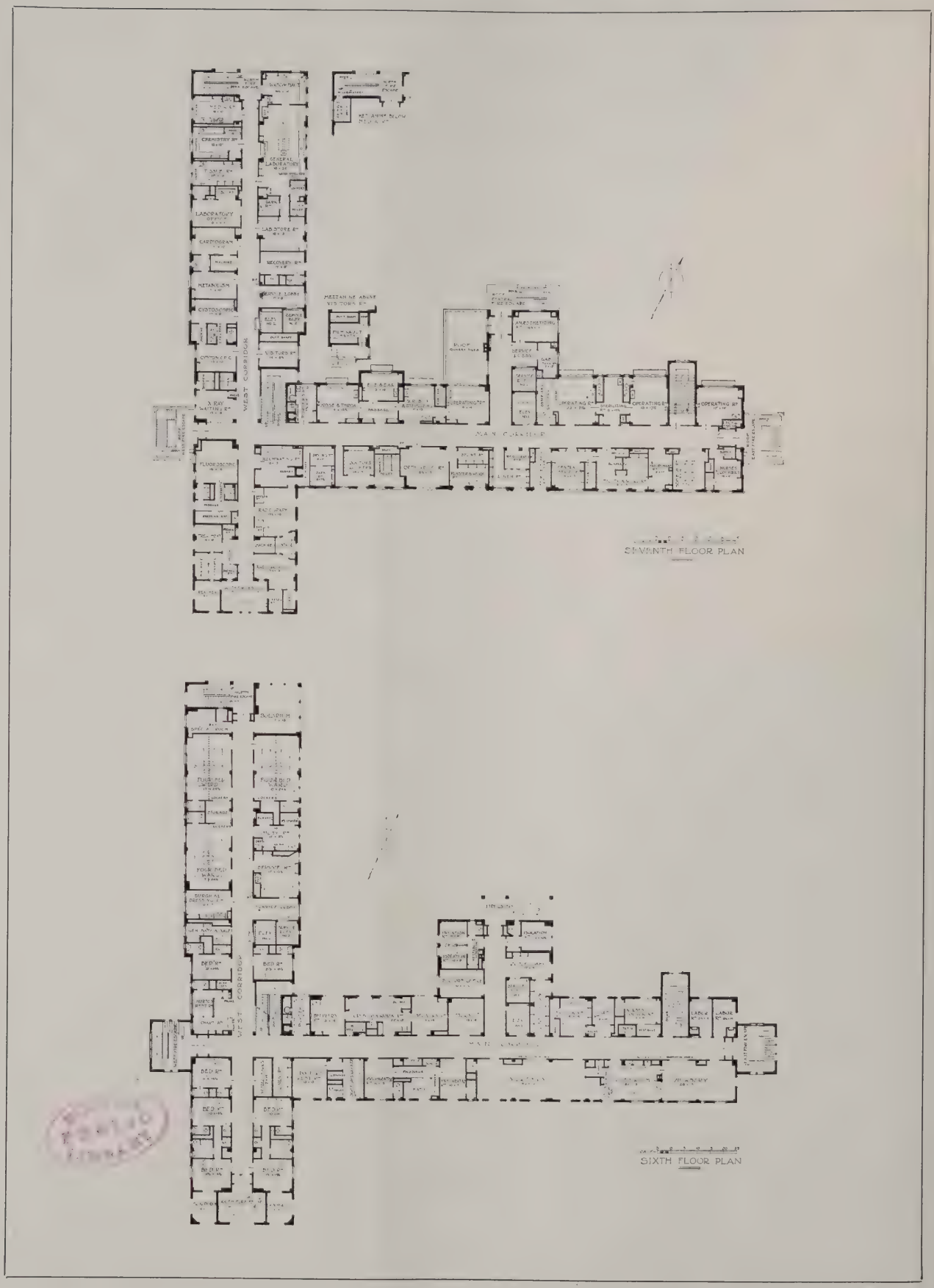

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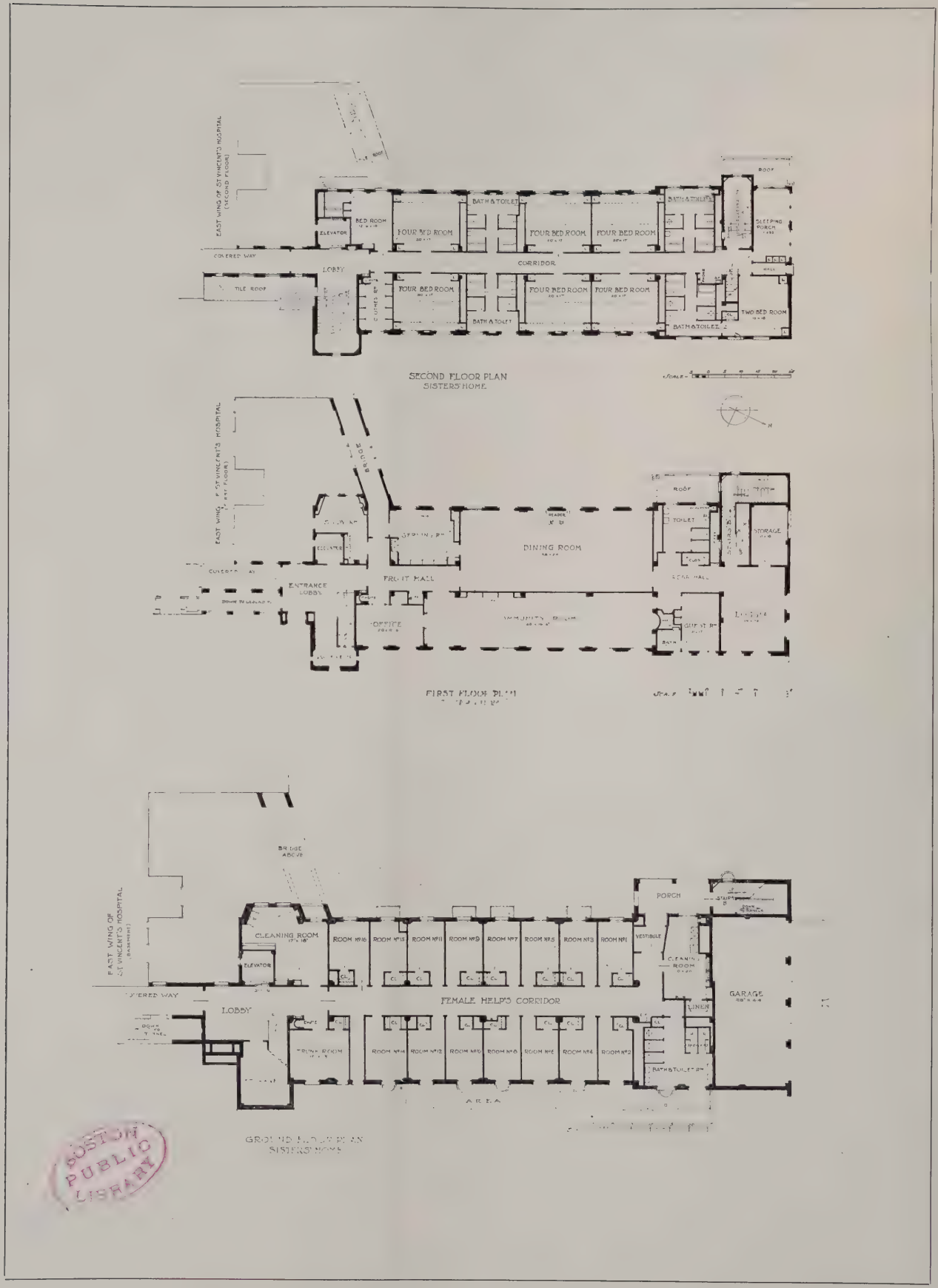

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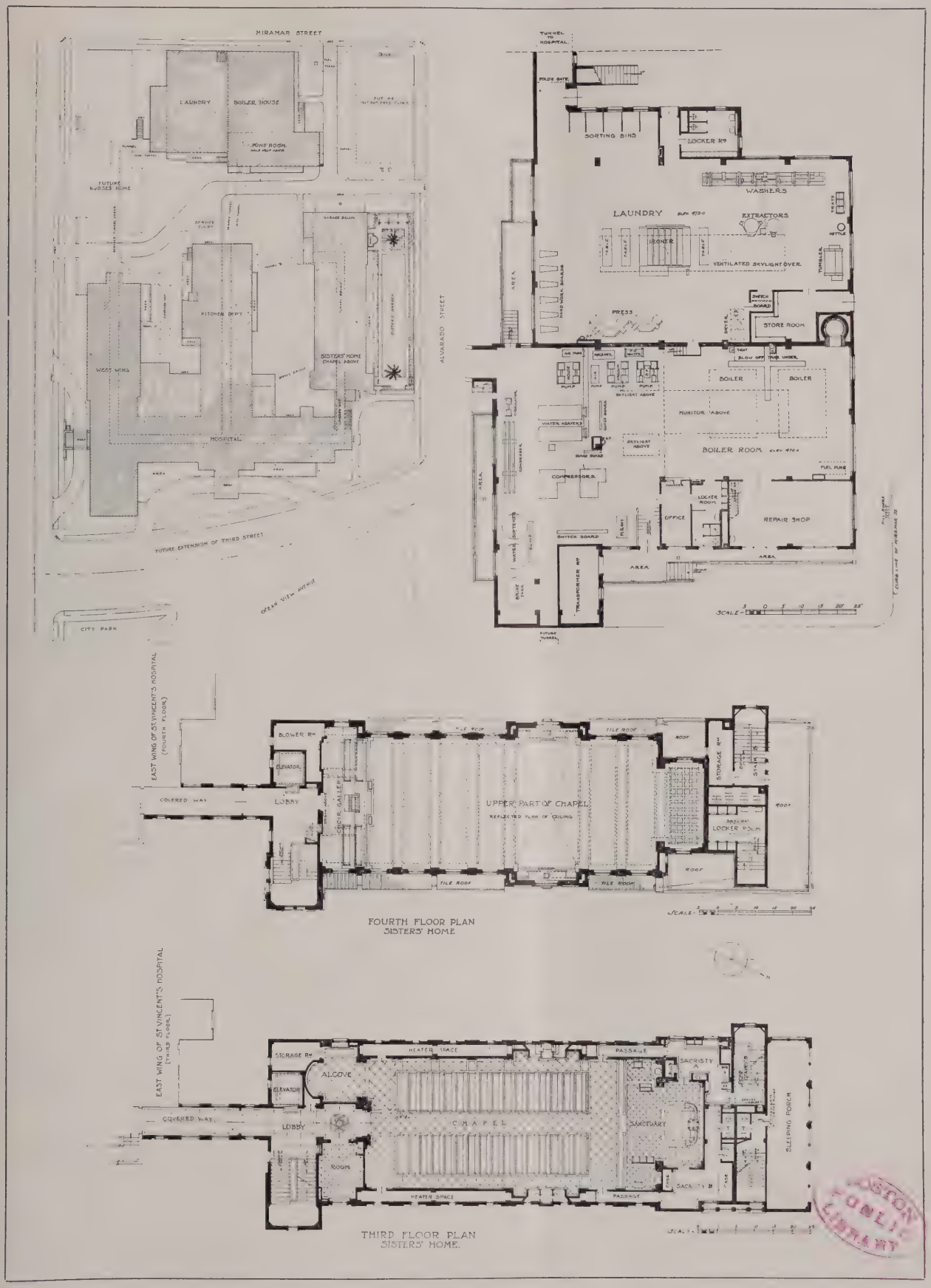

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St. Vincent's Hospital, Los Angeles
John C. Austin and Frederic M. Ashley, Architects

and worthy of study, owing to the fact that few if any other hospitals are similarly equipped. For instance, every water closet, in addition to having a flush valve, is fitted with hot and cold "bidet" jets, and the bowl has lugs cast in the porcelain to support the bed pan during the process of cleaning, the pans being specially made to fit in the tops of the bowls. Every bathroom and lavatory adjoining a patient's room is provided with a cabinet lined with sanitary tile and thoroughly vented, the front being enclosed with monel metal doors. These cabinets contain a complete equipment, consisting of all appliances needed for the proper care of the patient, making it unnecessary for the nurse to leave the patient. These appliances are not allowed to be taken from the room except for being sterilized.

Between the ceiling of the sixth story and the floor of the seventh, an intermediate story 6 feet, 6 inches high has been provided and is utilized as a pipe loft. Piping serving all floors up to the sixth story ceiling constitutes one system, and all above this level another system. In this pipe loft the vents from all fixtures are assembled in groups and carried through shafts to the roof. Mechanical vent systems are installed to exhaust the air from all vertical shafts occurring at the back of the lines of bath and toilet rooms. Independent vent systems are used to exhaust the air from operating rooms, laboratories, and other departments on the seventh floor, where special ventilation is necessary. It was found advisable to keep supply and waste systems of operating rooms and laboratories independent of all others, owing to the fact that there is more trouble developing in these departments than in the ordinary operation of the hospital. In addition to the plumbing system of the seventh floor, there are special gas lines conducting various kinds of gas to the operating rooms, and a complete system of steam lines to the sterilizers. All sterilizing apparatus adjacent to operating rooms is concealed in special compartments, so that only the valves and nozzles are exposed on the faces of the operating room walls. All these compartments are thoroughly ventilated. The continuing vertical shafts from sub-basement ceiling level to the pipe loft above the sixth story at the back of every line of plumbing fixtures, and the pipe distributing loft, make it possible to repair or remove any or every pipe without interference with the operation of the hospital. Also the pipe loft immediately below the surgery floor makes it possible to install any new sanitary, electrical or ventilating appliance that may be discovered or invented, and found to be desirable, without disturbing the structural elements of the building.

There is a complete system of tunnels extending from the power house and the laundry to and under every building, equal in width and location to the corridors in the upper stories of each building.

GENERAL VIEW

Photos, Harold H. Costain *Plans on Back*

MAIN ENTRANCE

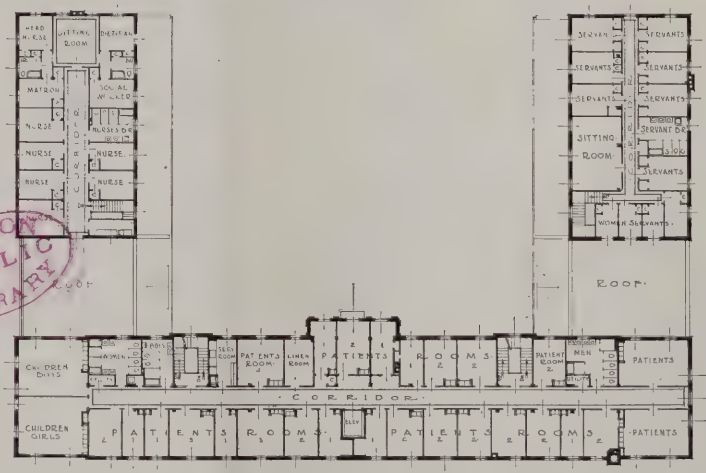
ST. LUKES CONVALESCENT HOSPITAL, GREENWICH, CONN.

WILLIAM S. GREGORY, ARCHITECT; ERNEST FLAGG, CONSULTING ARCHITECT

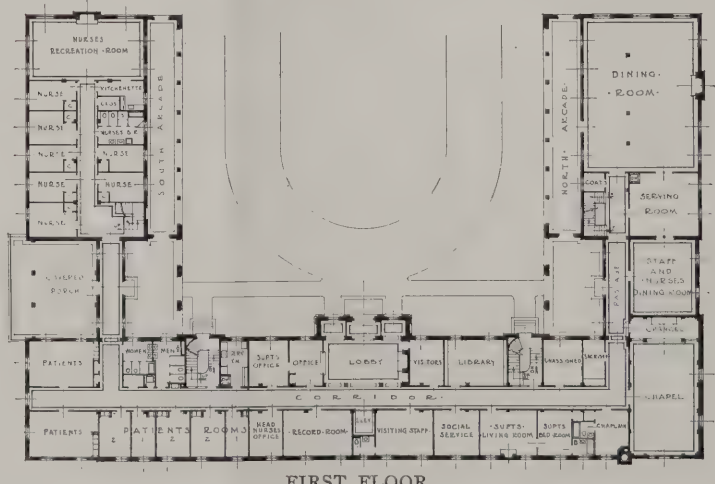
COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Fireproof.
Exterior Walls: Basement, concrete; upper stories, hollow tile with facings in brick and stone.
Floors: Linoleum, cemented directly to concrete and wax finished.
Windows: Wood.
Heating: Steam vapor system.
Ventilation: Mechanical for kitchen, toilets and baths.
Cubage of Building: 689,000 feet.
Cubic Feet Per Patient: 8600.
Cost of Building, Without Furnishings: 70 cents per cubic foot.
Cost Per Cubic Foot Completely Furnished: 80 cents.
Number and Cost Per Bed: 80 at $6,890.

THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

PLANS: ST. LUKE'S CONVALESCENT HOSPITAL, GREENWICH, CONN.
WILLIAM S. GREGORY, ARCHITECT
ERNEST FLAGG, CONSULTING ARCHITECT

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PATIENTS' OPEN AIR COURT

MAIN ENTRANCE LOBBY

ST. LUKES CONVALESCENT HOSPITAL, GREENWICH, CONN.

WILLIAM S. GREGORY, ARCHITECT; ERNEST FLAGG, CONSULTING ENGINEER

GENERAL VIEW

ENTRANCE HALL

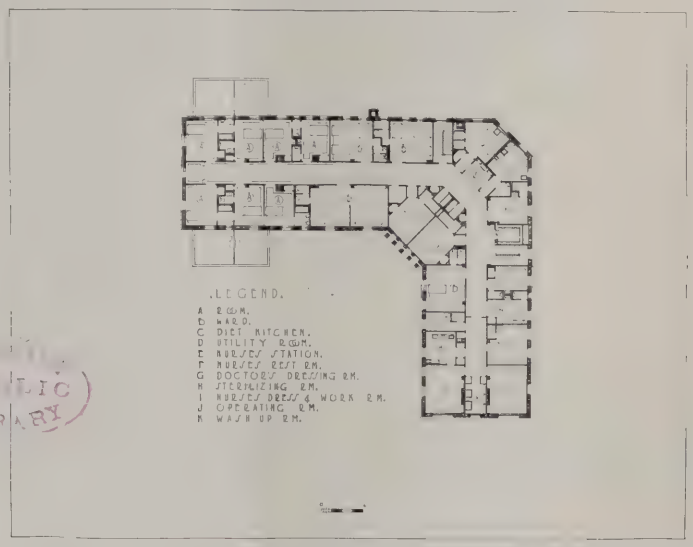
MAIN ENTRANCE

Photos. Gabriel Moulin *Plans on Back*

GREEN'S EYE HOSPITAL, SAN FRANCISCO
FREDERICK H. MEYER, ARCHITECT

COST AND CONSTRUCTION DATA

Date of Completion: April, 1928.
Type of Construction: Reinforced concrete.
Exterior Walls: 12-inch reinforced concrete.
Roof: Wood frame covered with tile.
Floors: Concrete slabs, tile and linoleum finish.
Windows: Wood frames and sash; metal in operating suite.
Heating: Steam heat, direct radiation, oil-burning boilers.
Ventilation: In operating rooms and baths.
Cubage of Building: 375,186 feet.
Cost of Building, Without Equipment: $208,000.



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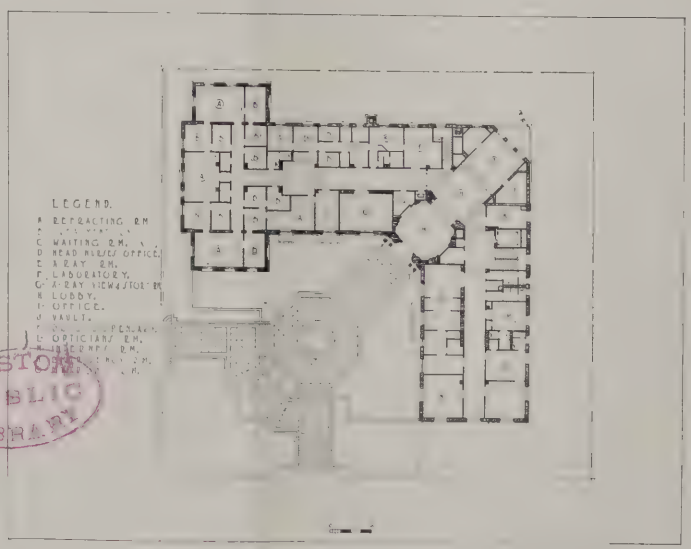


FIRST FLOOR

PLANS: GREEN'S EYE HOSPITAL, SAN FRANCISCO
FREDERICK H. MEYER, ARCHITECT

ENTRANCE FRONT

Photos. Paul J. Weber

REAR ELEVATION

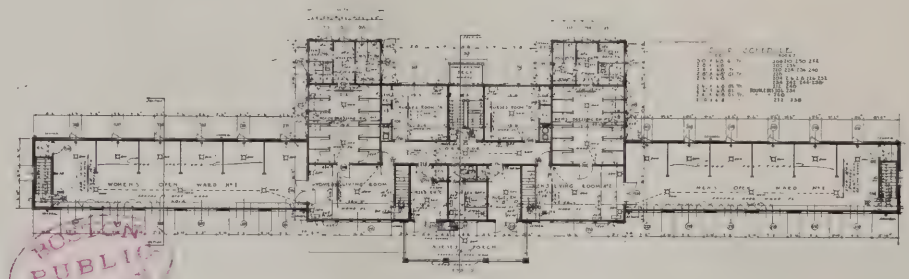
TUBERCULOSIS HOSPITAL, PHILMONT, N. Y.

TOOKER & MARSH, ARCHITECTS

Plans on Back

COST AND CONSTRUCTION DATA

Year of Completion: 1919.
Type of Construction: Frame.
Exterior Walls: Frame.
Roof: Slate.
Floors: Wood, and canvas over wood.
Windows: Wood, double-hung.
Heating: Low-pressure steam.
Cost of Building, Without Equipment: $90,000.



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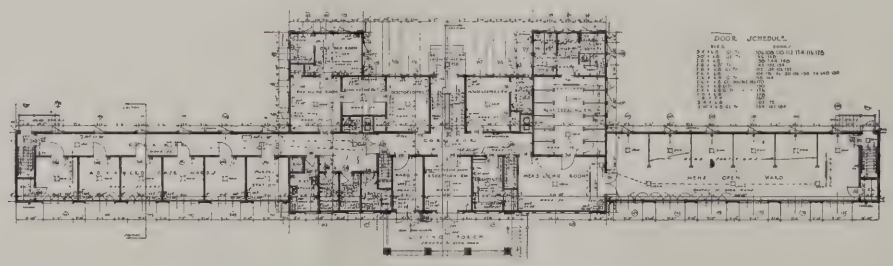


FIRST FLOOR

PLANS: TUBERCULOSIS HOSPITAL, PHILMONT, N. Y.

TOOKER & MARSH, ARCHITECTS

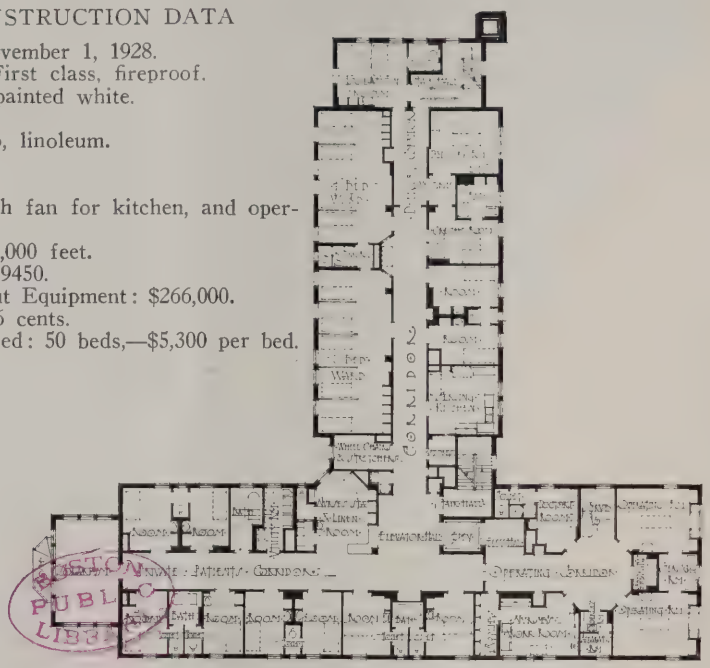
ENTRANCE ELEVATION

Plans on Back

END AND REAR ELEVATIONS
COTTAGE HOSPITAL, GROSSE POINTE, MICH.
STEVENS & LEE, ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: November 1, 1928.
Type of Construction: First class, fireproof.
Exterior Walls: Brick, painted white.
Roof: Brown tile.
Floors: Rubber, terrazzo, linoleum.
Windows: Metal sash.
Heating: Direct steam.
Ventilation: Gravity, with fan for kitchen, and operating room ventilation.
Cubage of Building: 471,000 feet.
Cubic Feet Per Patient: 9450.
Cost of Building Without Equipment: $266,000.
Cost Per Cubic Foot: 56 cents.
Number and Cost Per Bed: 50 beds,—$5,300 per bed.



PLANS: COTTAGE HOSPITAL, GROSSE POINTE, MICH.
STEVENS & LEE, ARCHITECTS

GENERAL VIEW

Photos. Paul J. Weber *Plans on Back*

OUTSIDE PAVILIONS

SOLEMAR HOSPITAL, SOUTH DARTMOUTH, MASS.

KENDALL, TAYLOR & CO., ARCHITECTS

COST AND CONSTRUCTION DATA

Date of Completion: June, 1924.
Type of Construction: First and second class.
Exterior Walls: Tile and stucco.
Roof: Slate and flat.
Floors: Terrazzo and linoleum.
Windows: Wood sash, double-hung.
Heating: Steam, vacuum system, separate power plant.
Ventilation: Local fans.
Cubage of Building: hospital, 310,000; boiler house, 27,130; garage 12,420 feet.
Cubic Feet Per Patient: 6,000.
Cost of Building Without Equipment: $295,044.
Number of beds: 50.

Second Floor

First Floor

PLANS: SOLEMAR HOSPITAL, SOUTH DARTMOUTH, MASS.

KENDALL, TAYLOR & CO., ARCHITECTS

ENTRANCE FRONT

Plans on Back

MILLS MEMORIAL HOSPITAL, SAN MATEO, CAL.
LEWIS P. HOBART, ARCHITECT

COST AND CONSTRUCTION DATA

Year of Completion: 1927.
Type of Construction: Reinforced concrete.
Exterior Walls: Concrete with stucco finish.
Roof: Slate.
Floors: Concrete, tile finish in corridor and living rooms.
Windows: Wood, double-hung.
Heating: Low-pressure steam.
Ventilation: Forced draft.
Cubage of Building: 612,730 feet.
Cost of Building, Without Equipment: $418,170.
Number of Beds: 80.

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PLANS: MILLS MEMORIAL HOSPITAL, SAN MATEO, CAL.
LEWIS P. HOBART, ARCHITECT

GENERAL VIEW

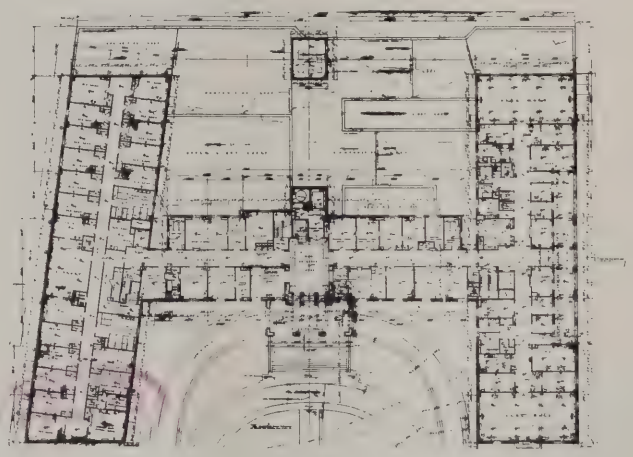
Photo. Tebbs & Knell

JEWISH HOSPITAL, ST. LOUIS

GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

Plans on Back

SECOND FLOOR



FIRST FLOOR

BASEMENT

PLANS: JEWISH HOSPITAL, ST. LOUIS

GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

BOSTON PUBLIC LIBRARY

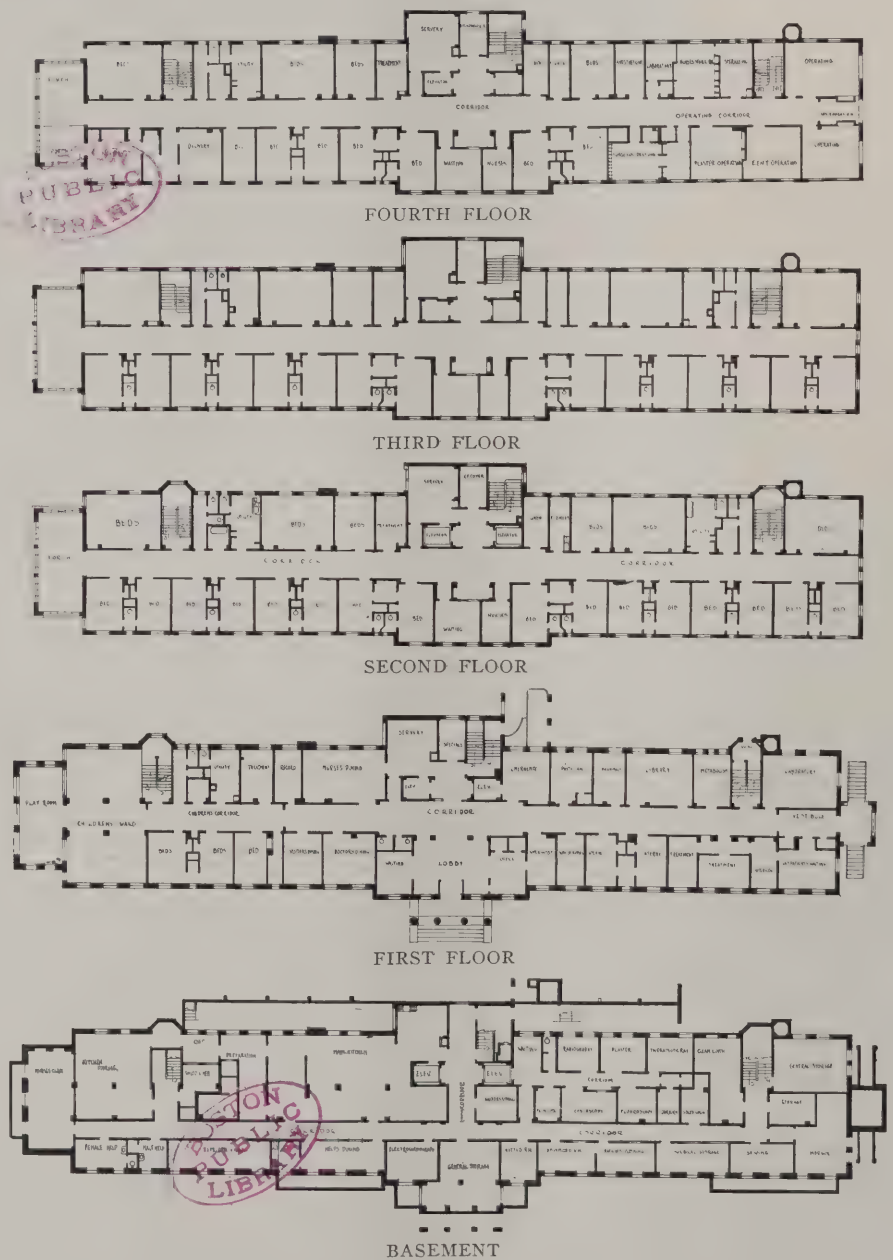
Plans on Back

GENERAL HOSPITAL, LINCOLN, NEB.
DAVIS & WILSON, ARCHITECTS

COST AND CONSTRUCTION DATA

Year of Completion: 1924.
Type of Construction: Reinforced concrete.
Exterior Walls: Brick, limestone trim.
Roof: Slate.
Floors: Oak, linoleum, tile.
Windows: Double-hung wood.
Heating: Vacuum steam.
Ventilation: Natural, except for exhaust fans in kitchen and sterilizing room.

Cubage of Building: 762,000 feet.
Cubic Feet Per Patient: 6,800.
Cost of Building, Including Fixed Equipment: $288,338.62.
Cost per Cubic Foot, Including Fixed Equipment: 37.8 cents.
Number and Cost Per Bed: 112 beds at $2,570.
Cost of Operating Per Bed Per Day: $4.50.



PLANS: GENERAL HOSPITAL, LINCOLN, NEB.
DAVIS & WILSON, ARCHITECTS

Photo. F. L. Fales *Plans on Back*

ROBINSON MEMORIAL BUILDING, HOMEOPATHIC HOSPITAL, BOSTON

KENDALL, TAYLOR & CO., ARCHITECTS

CONSTRUCTION DATA

Date of Completion: November, 1915.
Type of Construction: First class.
Exterior Walls: Brick and limestone.
Roof: Flat.
Floors: Gypsum slab, tile, terrazzo and linoleum.
Windows: Wood, double-hung sash.
Heating: Steam.
Ventilation: Exhaust fan, partial.
Cubage of Building: 616,760 feet.
Cost of Building, Without Equipment: $275,000.
Number of Beds: 84.

THIRD FLOOR PLAN

FIRST FLOOR PLAN

PLANS: ROBINSON MEMORIAL BUILDING, HOMEOPATHIC HOSPITAL, BOSTON

KENDALL, TAYLOR & CO., ARCHITECTS

BOSTON PUBLIC LIBRARY

FRONT ELEVATION

Photos. George B. Brayton

REAR ELEVATION

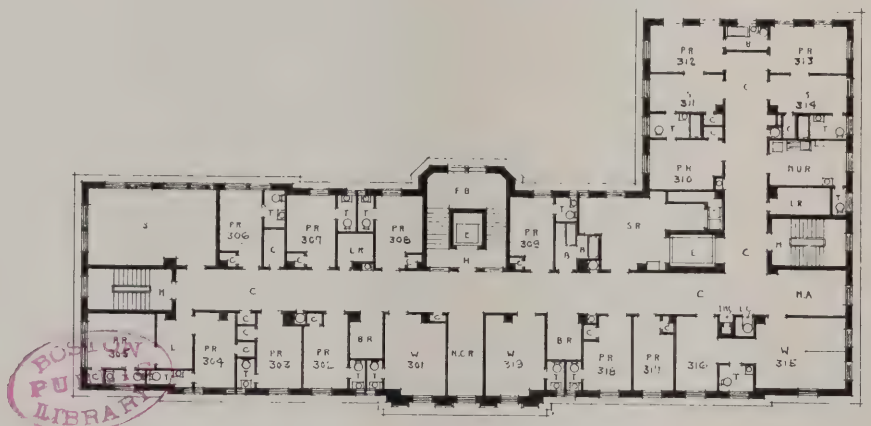
PALMER MEMORIAL HOSPITAL, BOSTON

ERNEST W. DEARING, ARCHITECT

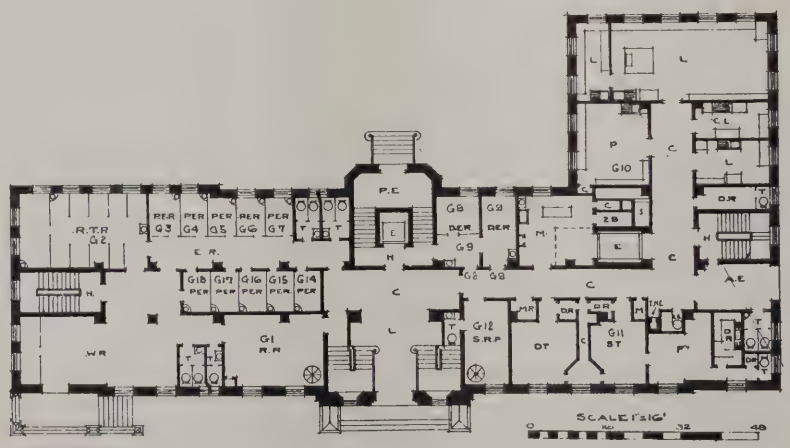
Plans on Back

COST AND CONSTRUCTION DATA

Date of Completion: February 1, 1927.
Type of Construction: Fireproof (one-way terra cotta.)
Exterior Walls: Brick.
Roof: Tar and gravel on concrete, and copper on concrete.
Floors: Tile and concrete construction: tile and rubber in upper floors.
Windows: Wood.
Heating: Steam from main plant.
Ventilation: Mechanical.
Cubage of Building: 736,700 feet.
Cubic Feet Per Patient: 1,500.
Cost of Building, Without Equipment: 66½ cents per cubic foot.
Cost per Cubic Foot, Completely Furnished: 95 cents.
Number and Cost Per Bed: 67 beds at $10,000 each.



SECOND FLOOR



FIRST FLOOR

PLANS: PALMER MEMORIAL HOSPITAL, BOSTON
ERNEST W. DEARING, ARCHITECT

MAIN ENTRANCE

STAIR HALL

PALMER MEMORIAL HOSPITAL, BOSTON

ERNEST W. DEARING, ARCHITECT

Photos. George B. Brayton

BOSTON PUBLIC

Plans on Back

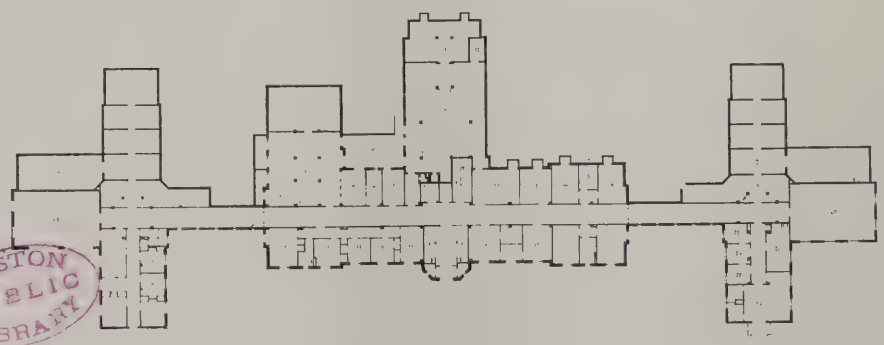
SHRINERS' HOSPITAL, PORTLAND, ORE.
SUTTON & WHITNEY, ARCHITECTS

Photos. Peasley-Jourdan

COST AND CONSTRUCTION DATA

Year of Completion: 1923.
Type of Construction: Reinforced concrete.
Exterior Walls: Concrete, faced with brick.
Roof: Copper shingles and tar and gravel.
Floors: Cement and mastic.
Windows: Wood.
Heating: Forced hot water.
Ventilation: No ventilation except in kitchen.
Cubage of Building: 535,000 feet.
Cubic Feet Per Patient: 8,900.
Cost of Building, Without Equipment: $263,750.
Cost Per Cubic Foot, Completely Furnished: 56 cents.

MAIN FLOOR



GROUND FLOOR

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PLANS: SHRINERS' HOSPITAL, PORTLAND, ORE.

SUTTON & WHITNEY, ARCHITECTS

OUT PATIENTS' ENTRANCE, SHRINERS' HOSPITAL, PORTLAND, ORE.
SUTTON & WHITNEY, ARCHITECTS

CUNNINGHAM SANATORIUM, CLEVELAND
VERNON REDDING & ASSOCIATES, ARCHITECTS

Photos. Tebbs & Knell, Inc.

AIR PRESSURE WARD, CUNNINGHAM SANATORIUM, CLEVELAND

GENERAL CONSIDERATIONS IN PLANNING A SMALL HOSPITAL

BY
H. ELDRIDGE HANNAFORD
OF SAMUEL HANNAFORD & SONS, ARCHITECTS

THIS article will touch on the major general considerations in the development of a small hospital program and the grouping and arrangement of the various component units. Plans on pages 874 and 875 are to exemplify a few of the general principles which governed the planning of one particular hospital, but which apply with equal force to hospitals twice or three times the size.

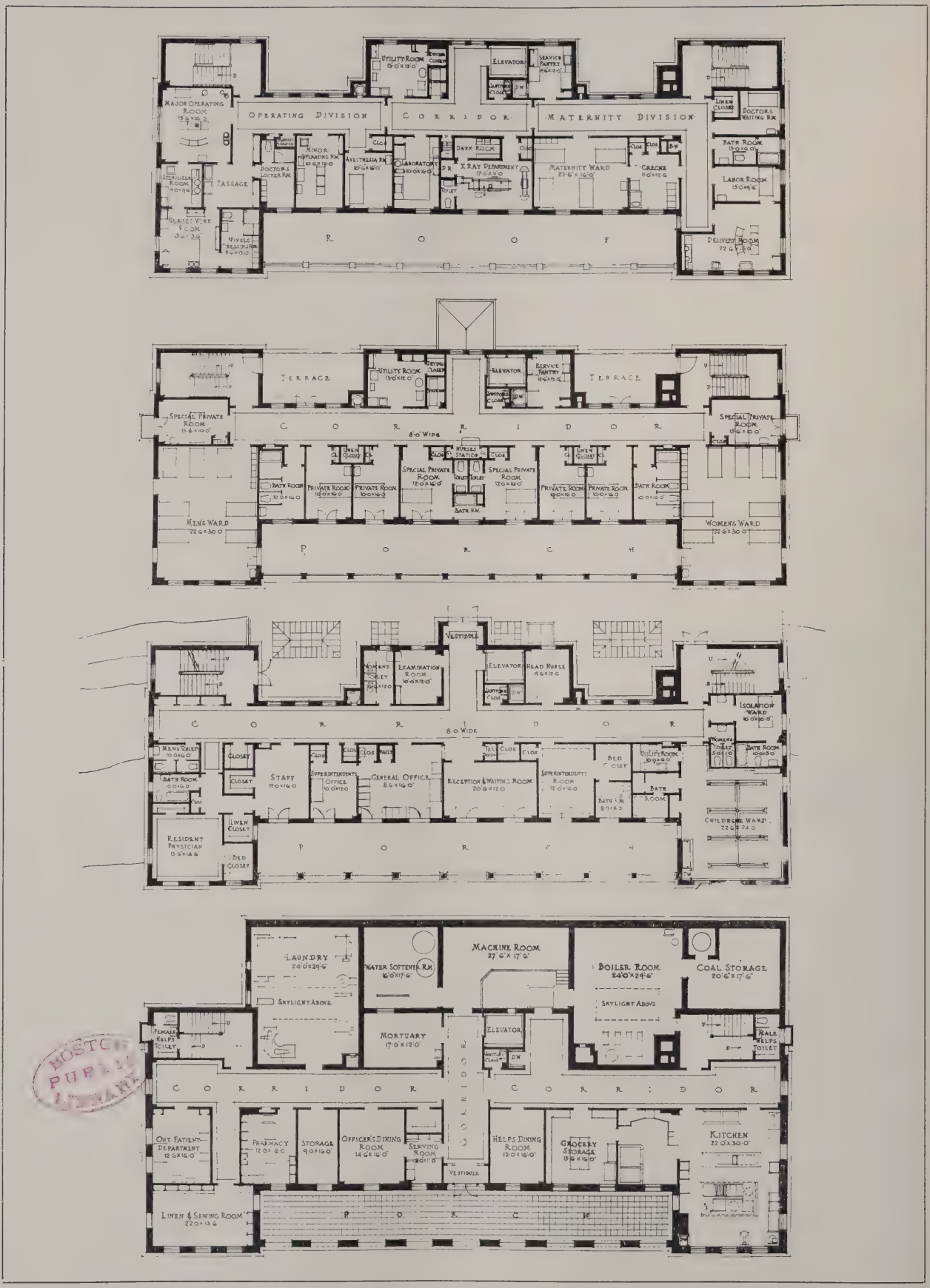
Site. This important factor is too often not given given sufficient consideration, and where possible the architect should give to the building committee every assistance in selecting a proper site. In the final analysis, the location of a hospital is the only part of the undertaking that may be considered as permanent. Buildings deteriorate structurally and become obsolete. Equipment wears out, becomes antiquated and must be replaced. It is obvious, therefore, that great care and sound judgment should be exercised in selecting the hospital's location.

Briefly, the factors entering into a wise decision in the choice of a hospital site are:

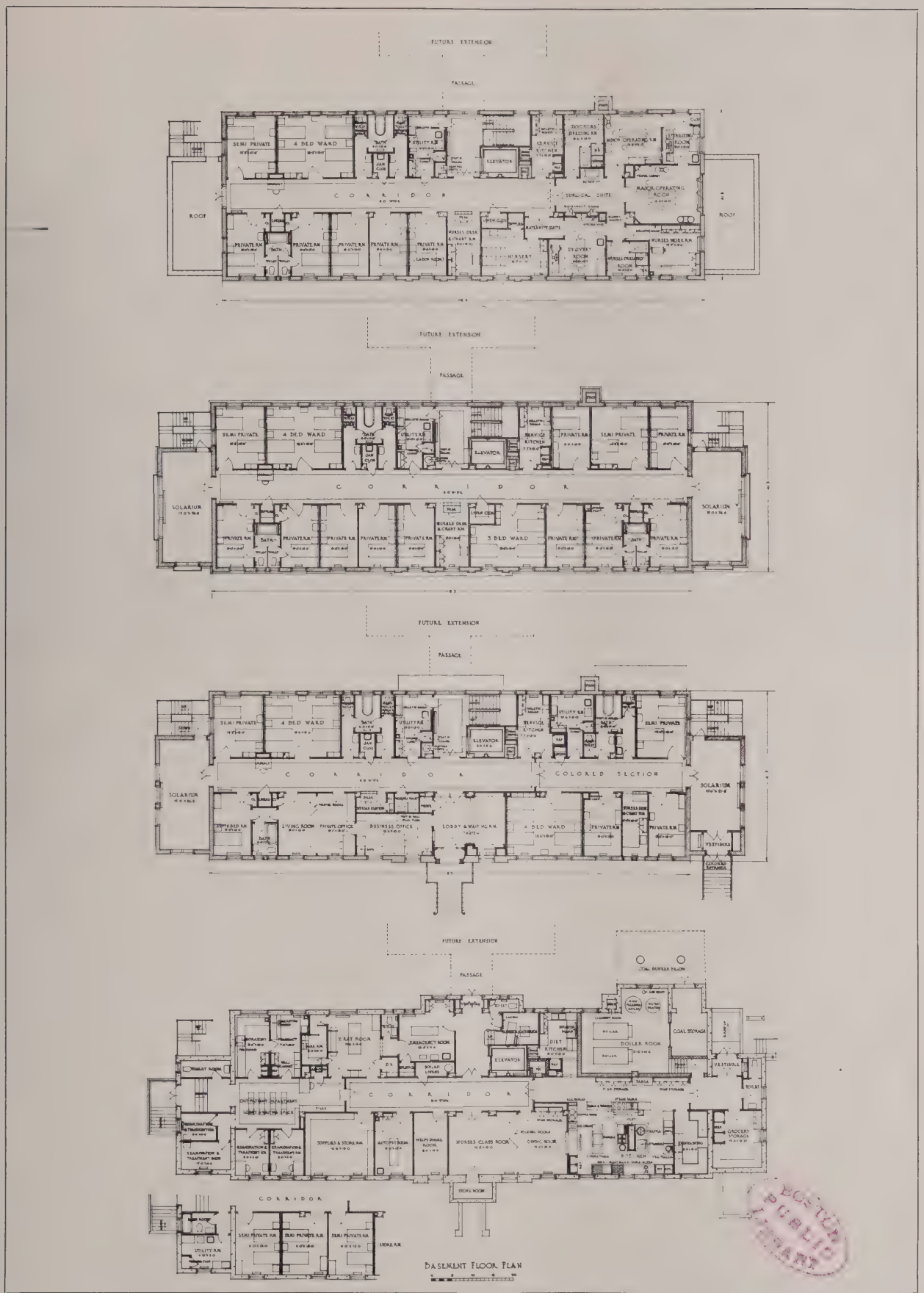
1. Quiet,
2. Clean Air,
3. Absence of Insects,
4. Suitable Outlook,
5. Accessibility,
6. Permanency,
7. Additions,
8. Costs,—Original Cost and Maintenance Cost.

Quiet can be secured by avoiding locations in close proximity to railroads, street car lines, factories and places of public assembly, such as churches, schools and playgrounds. Clean air, free from smoke, dust and odors, can be secured by avoiding manufacturing neighborhoods, railroad yards, and locations near much traveled or unsurfaced highways. Absence of insects, especially flies and mosquitoes, can be obtained by choosing a location at least half a mile from stables, stock yards, swamps or marshy places that cannot be controlled or drained. A suitable outlook is one that is restful and attractive. The sick and convalescent should not have to look out from rooms or verandas facing upon crowded streets or busy manufacturing sections. Rest is a universal remedy for all diseases, and it is too inexpensive for the sick not to have it in abundance. Beautiful natural scenery, fields, woods and distant hills, are very definite aids in hastening the convalescence of the hospital patient. Accessibility is obtained by locating the hospital as near as possible to the center of the population area to be served. It goes without saying that the hospital should be on a good road or roads and of easy access at all times. Permanency can be obtained by avoiding districts that are likely, in time, to change in character, or which may possibly develop into commercial or manufacturing centers. Additions to the hospital should be given their due weight in a final choice.

Hospital Group, Mariemont, O.
Samuel Hannaford & Sons, Architects



PLANS: TYPICAL SMALL GENERAL HOSPITAL FOR THE DUKE ENDOWMENT, CHARLOTTE, N. C.
SAMUEL HANNAFORD & SONS, ARCHITECTS



PLANS: TYPICAL SMALL GENERAL HOSPITAL FOR THE DUKE ENDOWMENT, CHARLOTTE, N. C.
SAMUEL HANNAFORD & SONS, ARCHITECTS

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Typical Small General Hospital for the Duke Endowment
Samuel Hannaford & Sons, Architects

It has been the history of nearly every hospital that its growth has far exceeded the expectations of those who had the original project in their charge. To select a site that does not permit of possible enlargements and additions is to make a mistake that may prove ultimately very costly. Costs almost always influence the choice of a hospital location. Sometimes a site may be donated by some generous citizen, but while the gift should of course be appreciated, it is not always wise to allow a free site to overshadow the many other considerations which should be given their due weight in a final choice.

Adaptability. In working out a hospital program and in evolving the general plans, the matter of adaptability must be always in the minds of those developing the project. First of all, the hospital must be adapted to the community's purse. Too often one sees a hospital which in itself may be ideal, and yet be so extravagantly planned and equipped as to be beyond the financial range of the community which it is supposed to serve. Such a hospital does not fill, to the fullest extent, its true function. A hospital should be carefully adapted to the size of the community which it is to serve, and the project should not be over-developed at the outset. The minimum bed capacity required should be determined, and the first unit be built to meet these demands, without, however, losing sight of possibility of future expansion as the needs arise. Every hospital should be designed with an eye to future additions and expansions, either in the form of wings, or separate buildings, properly located and fitted into the general plan. It is always preferable to expand laterally rather than vertically, as it can readily be seen that vertical expansion of an existing building interferes in a great many ways with the operating of the existing units. This applies particularly to extensions of plumbing and heating lines, stairways, elevator shafts and the like.

In the planning of general services, it should constantly be borne in mind that as extensions to the original building are made, increased demand will develop for the services. All such services as heating equipment, food service, main kitchen and diet rooms, utility rooms, laboratories, X-ray and operating departments should, where possible, be so sized originally as to take care of the additional demands when extensions are made. It is often possible to locate general services so that they will be central to the first unit as well as to future extensions. The matter of orientation of a hospital should be given the most careful consideration, and the building should be so located and adapted to the site as to secure sunlight in all of the patients' rooms for at least a part of each day. The power plant should be so arranged that the prevailing winds will blow all smoke and vapors away from the hospital. The surgical department should be so orientated that the

Typical Small General Hospital for the Duke Endowment
Samuel Hannaford & Sons, Architects

major operating rooms have either a north or western exposure. While it is true that the north exposure is preferable, a western exposure has become acceptable, due to the fact that more than 90 per cent of major surgical work is done before noon.

Choice of Materials and General Considerations. Unless a hospital is definitely determined to be a one-story building, with one-story extensions later, only a fireproof type should be considered. The advantages of this type of construction are manifest, even though the initial cost is somewhat higher than a composite or non-fireproof structure. Some of the more important advantages of fireproof construction are:

1. Safety of Patients.
2. Permanence and Low Depreciation.
3. Minimum Upkeep and Repair Cost.
4. Superior Sanitary Qualities.
5. Low Insurance Rates.

Assuming that the fireproof type of hospital has been determined upon, the various factors which should influence the selection of material through the building are in general:

1. Permanency,
2. Suitability for Type of Service,
3. Ease of Maintenance and Repair,
4. Availability in Local Markets,
5. Cost,—Original Cost and Maintenance Cost.

The item of cost is purposely put last for several reasons. First, the lasting qualities and satisfactory service of any material are remembered long after its initial price is forgotten. Second, any material which needs constant attention and thereby creates perpetual maintenance and upkeep cost is too expensive to consider, even if such a material should cost nothing originally. Third, true economy is not merely buying cheaply, but spending so wisely as to secure for every dollar spent the greatest returns possible in terms of service and low upkeep cost.

In order to keep the cost of a hospital to the economic minimum consistent with efficient administration, all component parts should be given most careful study. Floor space and cubic contents should be carefully considered, both from the standpoint of efficient administration and minimum maintenance and upkeep expense. All rooms should be sized and developed from the functional arrangement of the room, and all equipment should be carefully thought out and its location pre-determined on the drawings. Ceiling heights need not be greater than 9 feet. Every surplus inch of height in the building not only increases the original cost, but must be heated and kept clean, thus creating continuous maintenance expense. All units must be properly correlated, and in locating the service units, it should be borne in mind that the service units in question should be so located as to satisfactorily accomplish two things,—first, the location must be convenient

Photo. W. T. Myers & Co.

MEDICAL AND SURGICAL BUILDING FOR BETHESDA HOSPITAL, CINCINNATI

SAMUEL HANNAFORD & SONS, ARCHITECTS

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to the patients' rooms served by this unit, and secondly, the service unit should be so situated as to reduce to the minimum all nursing travel, and thus accelerate the nursing service, making each nurse more effective, and improving the hospital's service.

With regard to exterior design, it is never good policy to permit the exterior to influence the planning of a hospital. The exterior must be a dignified, frank and logical expression of the plan. While this is true with regard to all types of buildings, it is particularly true with regard to a hospital, because, after all, a hospital has but one purpose,—namely, to cure the sick; and a well planned, efficient and convenient hospital will accomplish this in less time and at a lower expense than will an inefficient type. The importance, therefore, of plan and general arrangement is paramount, and takes precedence over every other consideration until a satisfactory plan is worked out.

Service and Service Relations. No type of building requires so many service facilities to properly function as a hospital. In addition to the matter of services, the problem of traffic, both to and within the hospital, must not be lost sight of. In general there are five separate and distinct types of traffic converging at a hospital, and in the south a sixth type of traffic must be taken care of. In brief, this traffic divides itself thus:

1. Ambulant In-patients and Visiting Public,
2. Ambulance and Stretcher In-patients,
3. Out-patients,
4. Hospital Personnel and Staff,
5. Supplies,

and in the south, the sixth type of traffic,

Colored In-patients.

The hospital must be so planned as to provide for the efficient handling of the various types of traffic without their conflicting, crossing or interfering, one with another. By consulting the various plans in connection with this article, it can be seen how the matter of traffic has been worked out. The small hospital illustrating this article was designed for a rural county in the south, and the general types of traffic are taken care of in this manner: White hospital patients (that is, patients who are able to walk to the hospital, but who will remain in the hospital for some time) and the visiting white public, enter the hospital at the central front entrance on the first floor. Ambulance and stretcher cases enter at the rear central entrance on the basement floor. The colored in-patients are segregated in a suite on the first floor, reached by a separate entrance at the end of the building, this entrance being also used exclusively by ambulant colored in-patients and the visiting colored public. The out-patients (patients who merely visit the hospital for treatment) enter the basement at one end of the building, the white and colored out-patients being separated by assigning different days for their visits. All personnel can enter and leave the building through the front central entrance, or, preferably, the entrance on the first floor at the opposite end of the building from the colored entrance, or the rear central entrance in the basement. Supplies enter the building at a rear entrance in the basement, located near one end and of easy access to the main kitchen and store rooms. Under this general plan, as illustrated by the cuts, it can be seen that the crossing or interference between various types of traffic is eliminated or at least reduced to the minimum.

To be efficient, a hospital must have adequate service facilities properly located, so that all work can be done with the minimum loss of time and the least amount of effort by the hospital personnel. Some hospitals make the mistake of sacrificing service spaces in order to increase the number of patients' beds. This is a serious error, an error which it may be costly to rectify later, and it is far better to frankly face the fact that adequate service facilities must be installed than to under-service the building in order to slightly increase the bed capacity and then render a second class service at considerable expense year after year for as long as the building exists.

General services are, briefly, those services which are necessary to the entire hospital, such as stairs, elevators, dumbwaiters, incinerator, linen chute, main kitchen, boiler room, laundry, X-ray department, laboratory, pharmacy and emergency room. General services should be so located as to be central and convenient. Stairs should be central to the area served and easily accessible at all times. Where possible, stairs should be so located as to serve not only existing areas, but to be central to future extensions. Stairs should also be so distributed as to divide up equally the possible demands on them. Elevators should be located as near the center of the hospital as possible and should be in direct connection with, or easily accessible to, the ambulance entry, emergency room, main kitchen and public waiting room. While the drawings in this article show but one elevator, it is preferable, where funds permit, to install at least two, as this not only makes for a better classification of traffic in the elevators, but also provides a spare elevator should one, in an emergency, fail. Dumbwaiters should be centrally located and should furnish the vertical connection between the main diet kitchen and the service pantries on the various patients' floors.

Incinerator shaft and linen chute should be located near the center of the building so as to be about equi-distant from the extreme ends of the various floors. If possible, the linen chute should discharge in or near the laundry, although this is not absolutely essential. The main kitchen and diet kitchen should be located in the basement (provided adequate ventilation can be secured), and should be near or directly connected with the supply entrance and the elevators. The boiler room, if within the building, should be located near the supply or service entrance and should be in fairly close proximity to the kitchen. If funds are available, however, it is a better plan to locate the boiler room in either a separate building or wing,

and have it independently serviced in every respect.

The laundry, if within the building, can be located in the basement at the most convenient point. A good location for the laundry is under the children's ward, as this class of patients is not so easily disturbed by the noise of the laundry's operations. It is, however, good practice to consider the soundproofing of the laundry ceiling, if within the building. A better scheme is to locate the laundry in a separate building or wing, usually over the boiler room, if the boiler room is also detached from the main building, as should always be the case where possible.

The X-ray, laboratory and pharmacy may be located in any one of several places, depending on the service demands. It is usually customary to locate the X-ray department and the laboratory on the surgical floor, and a great many hospital superintendents prefer this location. On the accompanying drawings, however, the X-ray, laboratory and pharmacy have been located in the basement in connection with the out-patient department. This location is satisfactory, inasmuch as these services are of great importance in connection with diagnostic and treatment work. It will also be noted on the plans that the X-ray department is convenient to the emergency room, as it very often happens that it is desirable to use the X-ray in connection with accident cases, particularly fractures. The emergency room, as the name implies, is designed to care for the sudden arrival of an unexpected case, such as an accident, poison, burn, or sunstroke case. This room should be closely related to the ambulance entrance and to the elevators to give it the greatest usefulness.

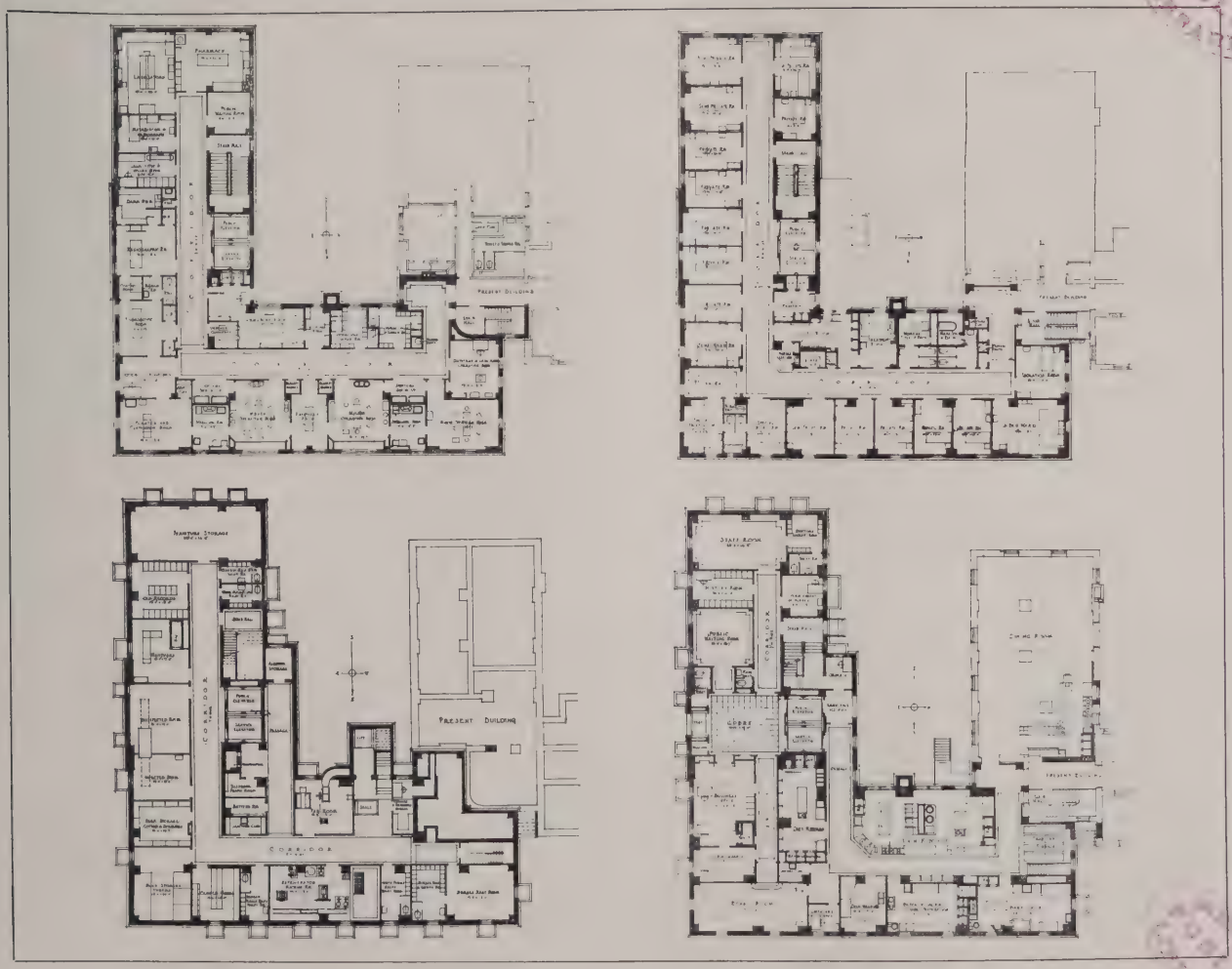
Special services are those service units which serve only a portion of the building, such as the floor nurses' station, the chart room, floor utility rooms, floor service pantries, and public toilets and bathrooms on the various patients' floors. The floor nurses' station and chart room should be located at such a point on each floor that the floor supervisor will have visual control of the entire floor. From this station the nurse in charge should be able to see the full length of the corridors and should have full view of elevators, stairs and other floor services. Since all patients' charts will be kept under the floor supervisor's control, it is also important to locate the nurses' station and chart room at a point as nearly at the center of the floor areas as possible. The utility room should be as nearly as possible equi-distant from the most remote rooms in this area. If possible, it is well to locate this particular service at a point where it will be central to future extensions as well as to present units. The utility room is probably the most important floor service of all and should be given most careful study, both as to location and arrangement of equipment. Floor service pantries should be centrally located for the same reason as given for utility room locations, but in addition to this, proper consideration must be given to the vertical connection with the main kitchen and main diet kitchen by means of dumbwaiter or elevator. Public toilets and bathrooms need not be centrally located, but such a location is preferable. By the term "public toilet and bathroom" is meant, of course, those rooms which serve the needs of patients occupying rooms without private toilet and bath facilities.

The foregoing represents. in a broad, general way, the main or basic considerations in planning any hospital, and has to do principally with inter-relationship of units, with regard to both areas and vertical connections. At the outset of the development of any hospital project, the architect, the hospital superintendent or the chairman of the building committee should confer with a hospital consultant of recognized ability and should carefully determine the bed capacity required and the general extent of the various services and departments. The surgical and medical units should be carefully considered, and the number of operating rooms and delivery rooms determined upon. The next step in developing the problem is for the architect and consultant to properly locate and inter-relate the various component parts of the plan, paying particular attention to the location of general and special services in relation to areas served thereby. After a general assignment of the major spaces has been made, each department should then be given careful study; furniture and equipment should be planned out in the most efficient manner, and department or room sizes should then be determined from this functional arrangement; doors and windows should be located so as to most efficiently serve each unit throughout the hospital.

Having carefully studied and planned each department, the matter of detailing and arranging for the various details of furniture, specialties and equipment should then be studied. In designing equipment, etc., bear in mind these main factors:

1. Equipment must be substantial in all respects and designed to withstand hard wear.
2. It must be designed and installed so as to be at all times easy to keep clean.
3. All projecting ledges, mouldings, etc., where dust may accumulate must be eliminated. Tops of cases or lockers should be furred in.
4. Where possible, equipment should be set up on sanitary bases of an impervious material, such as tile or terrazzo, so as to close up all joints or open spaces between the equipment and the floor, and also to permit mopping up the floor without damaging or defacing equipment, and also to reduce the costs of labor.

After all, the development of a properly planned hospital is merely the clear visualizing of hospital needs and pre-determining an exact program. From there on, common sense, painstaking care (particularly for little details), and an accurate knowledge of hospital technique and hospital requirements on the part of the architect will carry him successfully through. Success, however, let it be emphasized, is gained only by constant vigilance and attention to details apparently trivial but which are important.



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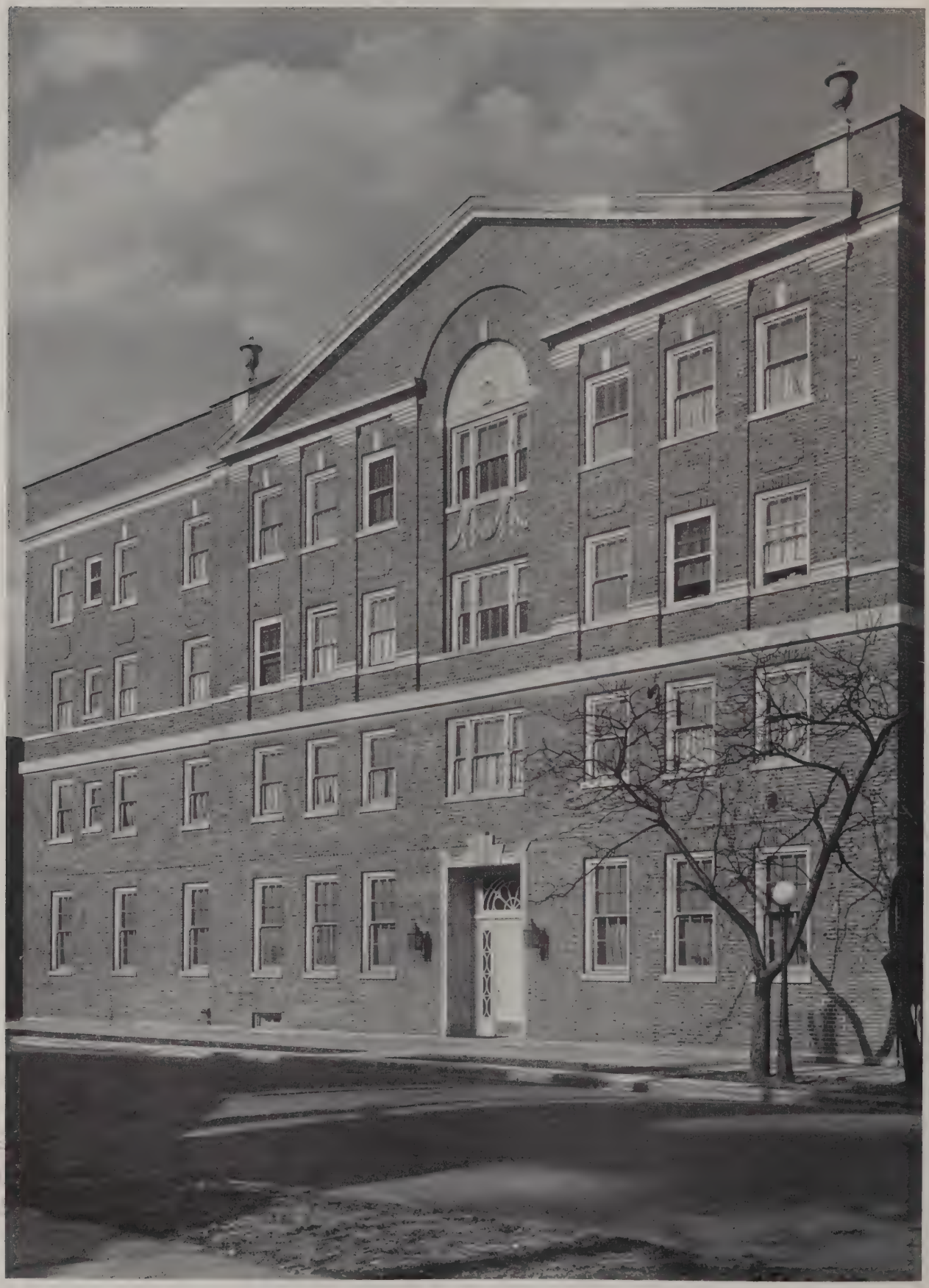

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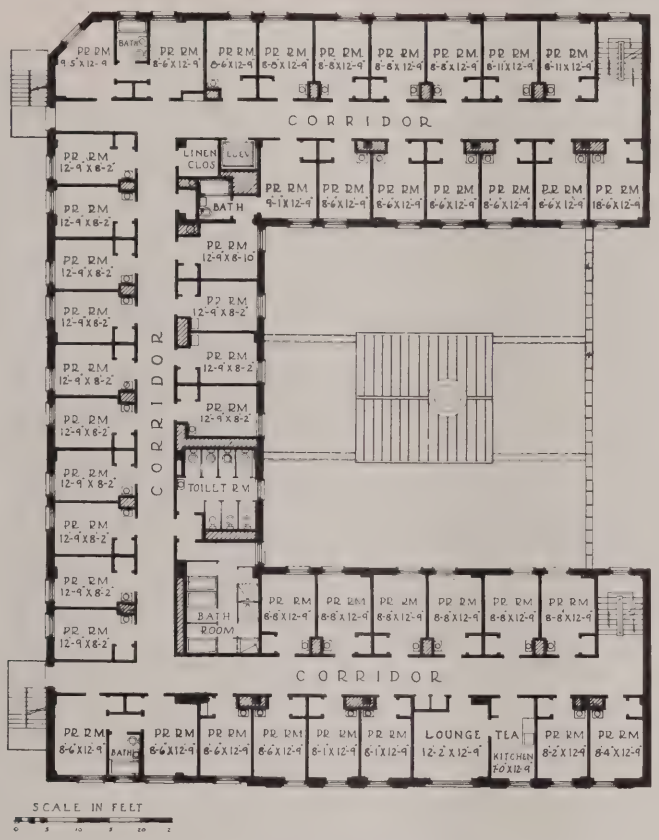

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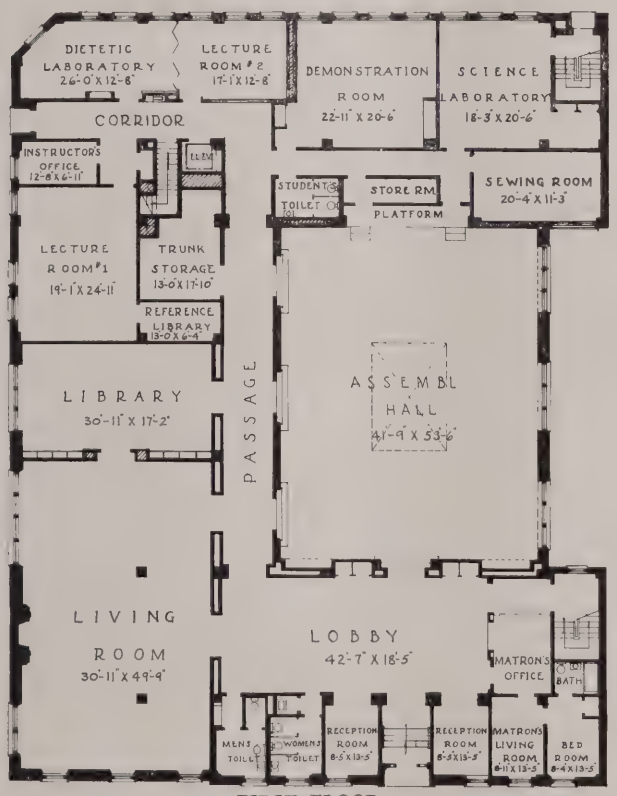

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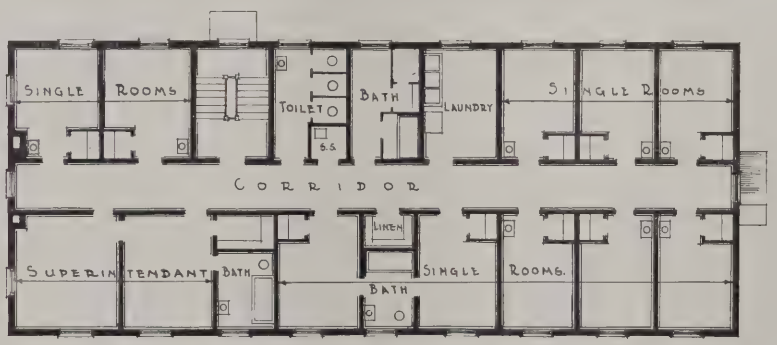

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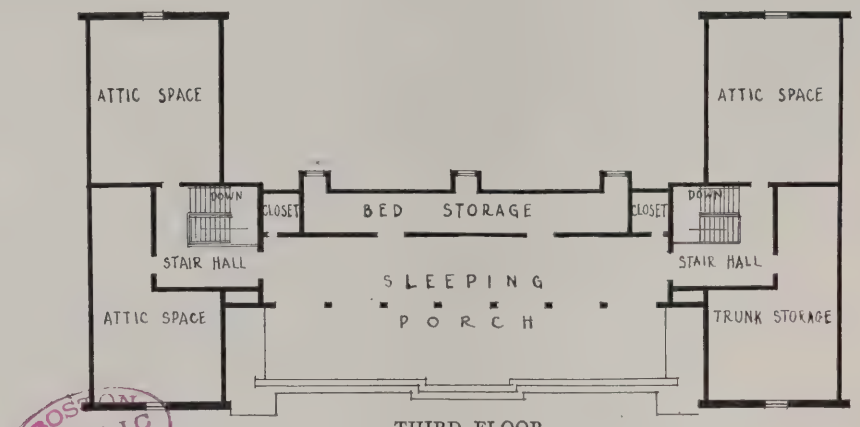

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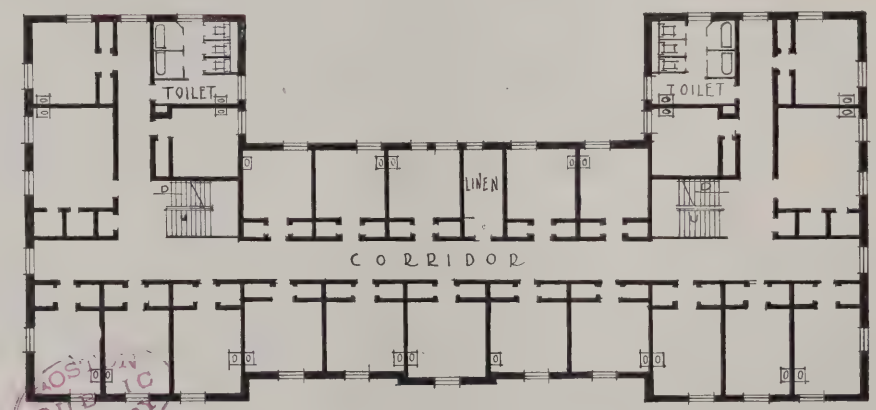

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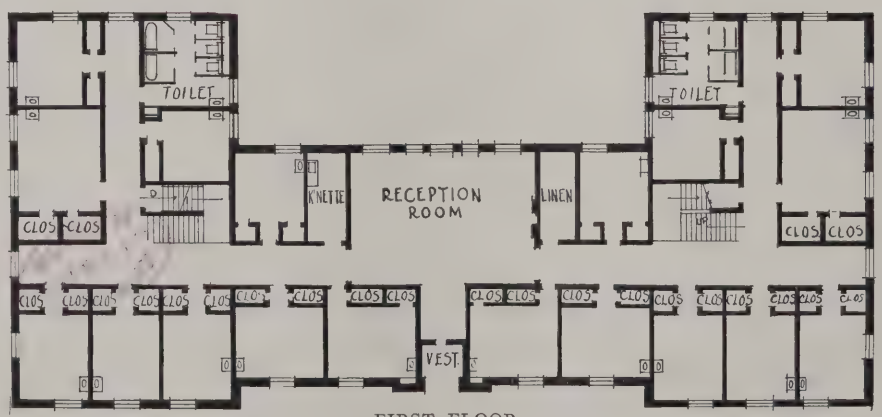

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PLANS: NURSES' HOME, STATE HOSPITAL, ANNA, ILL.
EDGAR MARTIN, ARCHITECT

THE PLANNING AND ARRANGEMENT OF AN EYE HOSPITAL

BY
FREDERICK H. MEYER, ARCHITECT

THE modern general hospital, through the influence of specialized medical service, has been so developed that it satisfactorily cares for most general or special hospital cases. However, it has been found that eye cases, by their very nature, are better cared for and yield to treatment with greater rapidity when brought to a separate institution.

Eye patients in most cases are not ill, nor are they in a great amount of discomfort other than having their eyes bandaged. The very fact of having both eyes bandaged, as is necessary following the majority of eye operations, makes the patient very sensitive to surrounding sounds. He hears things, yet he cannot tell what is going on, and his nervous system is affected. The usual noises that cannot be avoided in a general hospital may so annoy him and cause such aggravated fear as to seriously retard the recovery of an eye patient. When cared for in an institution devoted exclusively to ophthalmology, the patient is less disturbed, is happier and the post-operative recovery period is materially shortened. These are the facts that led to the establishment of Green's Eye Hospital in San Francisco, by Drs. Aaron and Louis Green. It is an institution that is devoted exclusively to ophthalmology, and is divided into two distinct departments. One department cares for the ambulatory cases, the patients who come in for examination and treatment. The other department is the surgical and hospital section.

The site of Green's Eye Hospital is on a corner, and the L-shaped building partly encloses a semi-formal terraced garden through which one approaches the first floor entrance lobby formed by the juncture of the two wings. By placing the two wings of the building away from the street, quiet and privacy as well as the maximum of air and sunshine have been insured. Directly accessible from the entrance lobby is that section of the building devoted to the doctors' offices and treatment room. Here are found the waiting room; the office of the nurse who arranges appointments and conducts the patients to the various treatment rooms; the five refracting rooms and surrounding treatment rooms; the room for special apparatus; the X-ray room and the laboratory all easily accessible to out-patients.

The nature of eye examination and treatment required careful planning of this section of the building. The basic unit in plan is the office or refracting room, from which radiate the small treatment rooms and rooms for dilating and for administering washes and for housing the special apparatus. The work necessitates at times the occupancy of all the rooms by patients undergoing some phase of treatment, and it is obvious that the unit must be arranged so as to permit the maximum amount of intercommunication with the minmum number of steps on the part of the doctor. When more than one unit is used, as is often the case in Green's Hospital, the problem is more difficult, for intercommunication between the various units must be maintained to insure an economical and flexible working arrangement. An efficient arrangement has been produced in this particular hospital by grouping the five refracting rooms in almost a circular formation with the groups of treatment rooms separating them. The refracting rooms are equipped with all essential apparatus pertaining to ophthalmology and are of the correct length for proper refraction. The windows are equipped with darkening shades, electrically operated from one shaft, and controlled by a single switch so that all the shades in a room may be raised or lowered simultaneously at the will of the doctor. Adjacent to the refracting and treatment rooms is the X-ray department with its dark room and a room suitable for the viewing and storage of plates. Also there is a small but completely equipped laboratory for research work. In conjunction with the examination and treatment department, but not directly connected with it, are the drug dispensary and the optician's suite. The optician's suite is a complete unit in itself with offices, waiting and fitting rooms, and connected directly with a large daylight-flooded grinding and work room in the basement.

A feature of Green's Hospital is the part-pay dispensary located on the ground floor and accessible through a separate street entrance. This dispensary cares for ambulatory patients who cannot afford the regular fees and yet who do not need or care to attend a free clinic. It is a complete unit in itself, consisting of office and waiting room, refracting and examination rooms, and drug dispensary.

The entire second floor is given over to surgical and hospital uses with all the usual utilities of a general hospital. The diet kitchen is served from the large, well lighted main kitchen located on the ground floor. The surgical suite, in the north wing, contains two standard-sized operating rooms, individually heated and ventilated and fully equipped. In connection with the suite are the wash-up and sterilizing room, work rooms and dressing rooms. Private bedrooms and rooms of two, three and four beds occupy the remaining area of the second floor. Throughout these rooms, and in fact throughout the entire hospital, every effort has been made to create a cheerful and attractive atmosphere. "Hospital white" has been studiously avoided. In its place are seen bright, harmonious colors in the walls, the tile and linoleum floors, in the woodwork, in the draperies and furnishings, and in the lighting fixtures.

A detail of inestimable value to eye patients is the complete radio installation throughout the building. Every bed has its radio outlet, and all the waiting

rooms and other public rooms are similarly equipped and controlled from a master station. This has proved a great boon to the patients who, through the nature of their disability, are deprived of the usual hospital pastime,—reading. The installation of a dictograph 'phone system in all the bedrooms is another interesting feature. Each room is connected with the nurses' station, and the patient simply takes the receiver or microphone from its place adjoining the bed. On receiving the double signal of light and soft buzz on the board at the central station, the nurse opens the key switch and the conversation is carried on by microphone and loud speaker. This system saves the nurses many needless steps.

In the creation of this building two thoughts were uppermost in the mind of the architect. One was to so plan the structure that the doctors could carry on their work with the utmost efficiency and economy of time and labor. The other was to give the building that atmosphere more suggestive of a luxurious and exclusive club or hotel than that of a hospital. Establishing a specialized institution is more or less a new adventure in the far west, but the faith of the founders is such that provisions have been made for future extensive additions which will more than double the capacity of the hospital and which will doubtless be built during the next few years to come.

Doctor's Wash Room, Green's Eye Hospital

Operating Room, Green's Eye Hospital, San Francisco
Frederick H. Meyer, Architect

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BOOK DEPARTMENT

"THE THEORY OF STRUCTURES"

Reviewed by FRANK W. SKINNER

PROFESSOR SPOFFORD'S long theoretical researches and experience as professor of civil engineering at the Massachusetts Institute of Technology, justly famed for its unusually high standards and thorough training in scientific and mathematical subjects, plus his distinguished record of design and construction in his consulting capacity, have well qualified him as an authority on the principles and methods of analysis and computation of bridges, buildings, roofs, arches, trusses, and girders that are essential elements of a large proportion of architectural and engineering construction. His thoroughness, clear thinking and writing, keen analysis and simple, direct methods, accurate, workable results and complete treatment of fundamentals, illustrated by everyday examples that demonstrate applications, make this volume not only authoritative, but exceptionally convenient and attractive both for study and for application to practical problems.

While it is primarily a comprehensive textbook for the technical student, it is exceptionally useful to the busy architect, engineer and designer who may follow it implicitly, and rely on it for rational and accurate methods of computation easily understood and efficiently applied. Its broad engineering field also covers features not usually specialized in by architects but which are here discussed and accessible in case of need. The chapters on Outer and Inner Forces, Laws of Statics, Reactions, Shears and Moments, Influence Lines, Concentrated Load System, and Graphical Statics, if carefully assimilated, afford adequate knowledge for the appreciation, understanding and solution of most ordinary stress problems. Especially valuable to the architect are the chapters on Framed Bents for High Buildings; Design of Columns and Tension Members; Beam Design, Plate Girder Design, and Space Framework; while the chapters on Three-hinged Arches, and on Masonry Arches with Fixed Ends, although specifically prepared for bridge work, are equally applicable to the principles involved in arches for walls, roof trusses and other architectural details. Chapter IV gives very simple explanations of shear and moment formulæ by which the strength of steel, concrete and wooden beams may be computed, and handbook tables checked or verified give an easy and rapid check on a large proportion of the members of ordinary floor construction. A convenient list of commercial dimensions of beam timbers and examples of computations for wooden steel beams is included. Chapter V presents a thorough discussion of

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single and multiple-web plate girders and the formulæ necessary for the computation of stresses and the proportioning of rivets, splices, stiffeners, flange plates, connection angles and fillers, besides consideration of practical details and illustrative problems that can be easily followed and applied for long or heavy spans in public and industrial or commercial buildings, etc. Chapter VII summarizes truss theory and the analytical and graphical methods of analysis and computation, determination of shear stresses and shear methods; it gives diagrams of typical trusses and examples of problems in stress determination, besides covering features most likely to occur in architectural work.

The discussion of three-hinged arches in Chapter X includes data on influence and stress tables that can be applied to long-span armory and auditorium trusses, etc. There is in Chapter VI a brief discussion and an explanation of popular formulæ for short and long columns. It shows principal types of riveted columns, briefly investigates eccentric forces, flexure and thrust, dimensions and cross sections, and illustrates methods of design and computation. Chapter XVI on Space Framework deals with structures composed of end-connected bars lying in more than one plane, which, owing to the arrangement of members, cannot be solved by division into several planar structures, and is devoted chiefly to computations of stresses and reactions in tripods, pyramids, frustums, polygonal rings and the Schwedler dome, illustrated by the solution of sample problems. Chapter XXI, the last in the volume, develops, explains and applies approximate methods of determination of stresses due to lateral forces, such as those from wind pressure, earthquakes, machinery vibrations, etc., in portal type framed bents of tall buildings where diagonal bracing is omitted and where the girders are rigidly fastened to the columns by connections capable of transmitting large bending moments through the columns to their foundations. These methods are based on assumptions that there are points of contraflexure of columns and girders and that the direct unit stresses and shears in columns are proportionate to the comparative locations of the columns with reference to the direction of the wind.

Data especially valuable to structural engineers and bridge engineers are given in other chapters that discuss bridge trusses with secondary web systems, trusses with multiple web systems, lateral and portal bracing, transverse bents and viaduct towers, skew bridges, lateral bracing trusses, transverse bents in mill buildings, long-span bridge types, cantilevers and equations of conditions, riveted truss joints, bridge pins and the arrangement of members on pins, statically indeterminate girders and trusses, continuous girders, three-moment equation, theory of least work, slope deflection theorem, redundant members and temperature stresses, swing bridges, masonry dams, earth pressure, cohesion and friction, and surcharged walls.

The volume is neither elementary nor complex; it does not abound in short cuts, easy approximations or long tables giving general results by inspection or interpolation. It does not serve as a handbook of arbitrary, empirical or commercial information for the non-technical designer incompetent to analyze and compute. It is a book easily digested by a designer familiar with simple computations and analysis who will find it a guide to the

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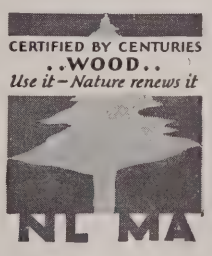

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ARCHITECTURE and interior decoration, if they are to entirely serve their proper functions, involve much use of color; unless they make use of the resources which color affords, architecture largely fails to meet its opportunities, and decoration becomes thin and anæmic. Americans have been said to be "afraid of color," and to be given to adopting cautious and tentative schemes which involve little of its use, the result of which leaves much to be desired. It is only during the past few years that color, so far as America is concerned, may be said to have come into its own, due of course to a better understanding of color and use of its resources to create that vitality which it is one of the purposes of architecture and decoration to supply. This volume is a valuable addition to a series of handbooks on the use of color. It deals with the subject in a way which is direct and logical, and one of its parts discusses the use of color and lighting in theaters and display windows, which of course are largely dependent upon lighting and color.

REAL ESTATE QUESTIONS AND ANSWERS. By I. Flapan. 342 pp., 6 x 9 ins. Price $5. Prentice-Hall, Inc., New York.

THE development of many an architect's practice has come to involve considerably more than was imagined even a few years ago. Securing excellence of design and planning, important as it is, no longer constitutes the sole or even the chief end of an architect's endeavors, for securing the best and most efficient equipment of many kinds is now of as great if not greater importance, and lately the architect has been forced to enlarge the range of his activities by adding the exercise of other functions which touch even when they do not at least partially cover what is generally regarded as the province of the real estate operator. The client in many instances now looks to his architect for guidance through a maze of detail and technicality regarding the acquisition of property and its improvement. This involves matters of title, contract, payment, profitable investment, loans, bond issues, leases, etc., and added to all this there comes what constitute logically the architect's proper functions,—the designing and planning of what is to be built. The architect, even though he may have at his beck and call the best of counsel and many of the adjuncts of big business, may well learn from whatever source he may.

This work, prepared by a member of the New York Bar, who is also manager of the Bronx County Mortgage Company, while intended primarily for the laity in general or for those who are about to enter the field of real estate, is filled with matter of interest to the architect. The author discusses, intelligently, the legal principles involved in real property in addition to the everyday problems of the practical side of real estate. The book

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BUILDING THE HOUSE OF GOD. By Elbert M. Conover. 217 pp., 6 x 8½ ins. Price $2.50. The Methodist Book Concern, New York, Chicago and Cincinnati.

THE designing of churches, along with the designing of structures for purposes secular, shows steady improvement. One has but to look back over the past one or two decades to realize that there were then hardly more than two or three American architects who possessed more than casual interest or more than average ability in the construction of churches, and those few were concerned chiefly, if not solely, with commissions of large extent involving considerable cost; the church of small or medium size was left to chance, with results which were not always encouraging. At present there are many architects whose church work is of great excellence, and the architectural publications are constantly presenting illustrations and plans of small churches,—sometimes very small,—which are admirable.

Many of the large religious bodies, realizing perhaps the need of improvement in church design and sensing the drift of public opinion, have established "departments of architecture" from which, under the supervision of trained architects, plans and designs are supplied to congregations about to build. This volume, issued by the Methodist Book Concern, is a review or survey of the activities of such a department, giving illustrations of many churches of varying sizes, and abounding in suggestions likely to be of value and interest to building committees and others concerned with the erection and equipment of churches and their accessory buildings. The volume lacks, however, the names of the architects who designed the churches illustrated.

PROVINCIAL HOUSES IN SPAIN

By Arthur Byne & Mildred Stapley

ARCHITECTS value Spanish types of domestic architecture because of their simplicity of design and plan and also because they are easily developed in materials inexpensive and easily had. Spain offers a choice of several kinds of residence architecture, types sufficiently different from one another to afford considerable range of selection, yet all possessing the same strength and virility, the excellent lines, the same graceful but unaffected grouping, and the discriminating use of detail which renders distinguished so many Spanish domestic buildings.

Houses in various parts of the Spanish peninsula, particularly the buildings of medium size in rural districts or provincial towns, offer excellent precedent for use in different parts of America where climate conditions are about what prevail in the provinces of Spain.

IN this volume two well known writers on Spanish architecture and decoration review the various forms which are given to the small or medium sized house in Spain. To render the work as helpful as possible to architects, the authors have included many plans and drawings of different kinds, details of such exterior parts of buildings as friezes, cornices, windows, timber overhangs, soffits and balconies, or of such interior parts of the structure as ceilings, fireplaces, doors and stairways. Part of the work deals with the tiles, pottery, ironwork, plaster in relief and the other forms of craftsmanship which contribute so much to the excellence of domestic architecture in Spain. It is a work likely to be invaluable to the designer.

The book contains text and 190 plates 12½x16 inches, and is bound in cloth. Price $30, postpaid.

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The Architectural Forum

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER SIX

DECEMBER 1928

HOSPITAL DETAILS AND FINISH

BY
EDWARD F. STEVENS

WHILE the architectural plan of the hospital with its correlation of one department with another, its protection of the patient from disturbing elements, etc., is most essential and necessary, the intimate details of finish, hardware, plumbing fixtures, floors and decorations have much to do with the comfort and well being of the patient and indirectly with the success of the institution. However fine the exterior design, and this is essential, each department must dovetail with another, and the essential parts of this dovetailing are the details and finish.

Perhaps there is no more discussed detail of the hospital than the floors, and most careful statistics have been compiled by hospital committees as to the wearing qualities, suitable colors, fitness of position, etc., of various materials. Many floor materials have been developed, tried and "found wanting." Others have proved satisfactory for a period of years, only to develop serious defects in manufacture until the hospital architect is "put to it" to know how to advise wisely. No material can be equally good for every place, but a material should be selected, (*a*) for its suitability for the location, (*b*) for color effect, (*c*) for its lasting qualities,—and just a few of these are mentioned here.

Cement. Perhaps more floors and bases are made of Portland cement than of any other material, principally because of its cheapness combined with its hygienic qualities; when properly treated it is very satisfactory, particularly for basements, room bases, and borders to floors where other materials are used for centers.

Terrazzo. No more enduring floor has been found than terrazzo,—a combination of marble chips and Portland cement,—which can be produced in many colors, and when combined with tiles or marble insertions, most satisfactory designs can be secured; when laid on reasonably small areas of from 10 to 20 feet, with metal separations, the result is generally satisfactory. Various forms of magnesite floors are used with varying results, depending on material and workmanship. For special uses, no better floor can be secured than one of the mastic or, as it is sometimes called, "plastic linoleum" type, and similar material made in tile form, pressed to a hard surface, makes perhaps the most ideal laboratory and utility room floor.

Linoleum. For the patients' rooms, where resiliency and warmth of color are needed, there is no more suitable and inexpensive floor than linoleum, and with the varying colors and patterns now to be had, most pleasing effects may be obtained. When properly laid by experienced men, a most enduring floor is secured.

Rubber Tiles. With the vast possibility of color effects, use of combinations of designs and patterns has become almost universal for corridors, entrances, and in fact almost any place not affected by dampness from below. One of the great advantages of the rubber floor is the simplicity of care required and its freedom from noise,—two really important items in a well regulated hospital. Added to its need of little care is its resiliency, which acts as a sound absorber.

Tile in its various colors, shapes and sizes will many times prove to be the only satisfactory material for use in a solution of the floor problem. Perhaps no more satisfactory floor for the kitchen can be had than the so-called "quarry tile," or for the operating room than the vitreous flint tile.

Marble will always be used for general floors where the strictest economy is not necessary. Care in selection of a close grain structure is essential. In the smaller hospitals, where frame construction may be necessary, the common practice is to use a wood floor of some hard material like maple or birch. Whatever be the floor material, care and upkeep must be considered for permanency. With the floors should also be considered the wall material, and here tile is the universal favorite for walls of operating rooms and certain service rooms; but even the finished tilework loses its dignity as a hygienic finish if not kept on a line with the frames and plaster, and this is done by allowing a recess of sufficient depth for tile setting, for while the projecting tile may finish with a beautifully moulded cap, there is always the feeling of something forgotten by the architect.

WALL TREATMENT. The methods of wall treatment possible are as varying as the treatment

of floors, and like floors they depend upon the clients' pocket books. For the walls of the kitchen and laundry, where steam is a factor, some vitreous surface is desirable,—either enameled brick which may be built with the construction, or glazed tile, which may be laid after construction. While it is desirable to extend the glazed surface to the ceiling, if for economy or other reason only a portion of the wall is tiled, the plaster line should continue on the same plane with the tile, and the door and window frames should be of sufficient width to receive the extra thickness. In such rooms as sink rooms, serving kitchens and toilets, especially back of plumbing fixtures, and in sterilizing rooms, the entire height, where possible, should be faced with tile, and at slight extra expense color can be used to advantage in panels and friezes. The walls of the operating rooms are more easily cleaned if they present a glazed surface. Light gray, buff or green are colors much used, and even the dark gray, with the equipment and gowns of the doctors and nurses of the same color, has become with some surgeons very popular.

Marble, especially fine grained marble, is not only a hygienic, but also a highly artistic wall material. For the wall treatment of toilets and shower baths, marble may be used with economy. Built-in metal cabinets of new and hygienic construction are beginning to replace plastered walls for clothes closets and cupboards and are vastly more flexible.

Vitreous slabs of opaque white or colored materials are made that are impervious, attractive and sanitary. They are available in large sizes, involving but few joints, and may be used in many places.

Rubber tile makes not only a serviceable dado, but acts as a resilient buffer for beds and food carts. It should, however, be set even with plaster lines.

Terrazzo, either pre-cast or built-in-place, gives excellent wear.

Stucco, in the form of imitation stone, or applied in various forms and colors, provides simple and artistic wall treatments for entrances and official rooms.

Of course, the most common treatment of walls is with *plaster,* preferably of the hard variety, and when it is not subjected to rough usage it is a durable material. The most common method of treating plaster is with *paint,* and with well dried walls and a selection of the proper colors, with or without decoration, it is quite satisfactory.

The day of plain white walls is, let us hope, gone by, and decoration in the form of "sanitary" wall fabrics is now being used to good effect at low cost, so that the private room of the hospital may be as artistic as the private bed chamber of the home. Simple decorations for the children's wards and play rooms may be made by the pasting of paper figures on the walls and then treating them with varnish. The hanging of pictures upon the walls of the sick room is generally "taboo," but simple and artistic treatment may be obtained by making a slight insert in the plaster and securing with glue one of the many really beautiful colored prints, which is then varnished over.

FINISH. While rounded corners do not make a hospital, the absence of sharp angles, both interior and exterior, in finish and bases, has a tendency to

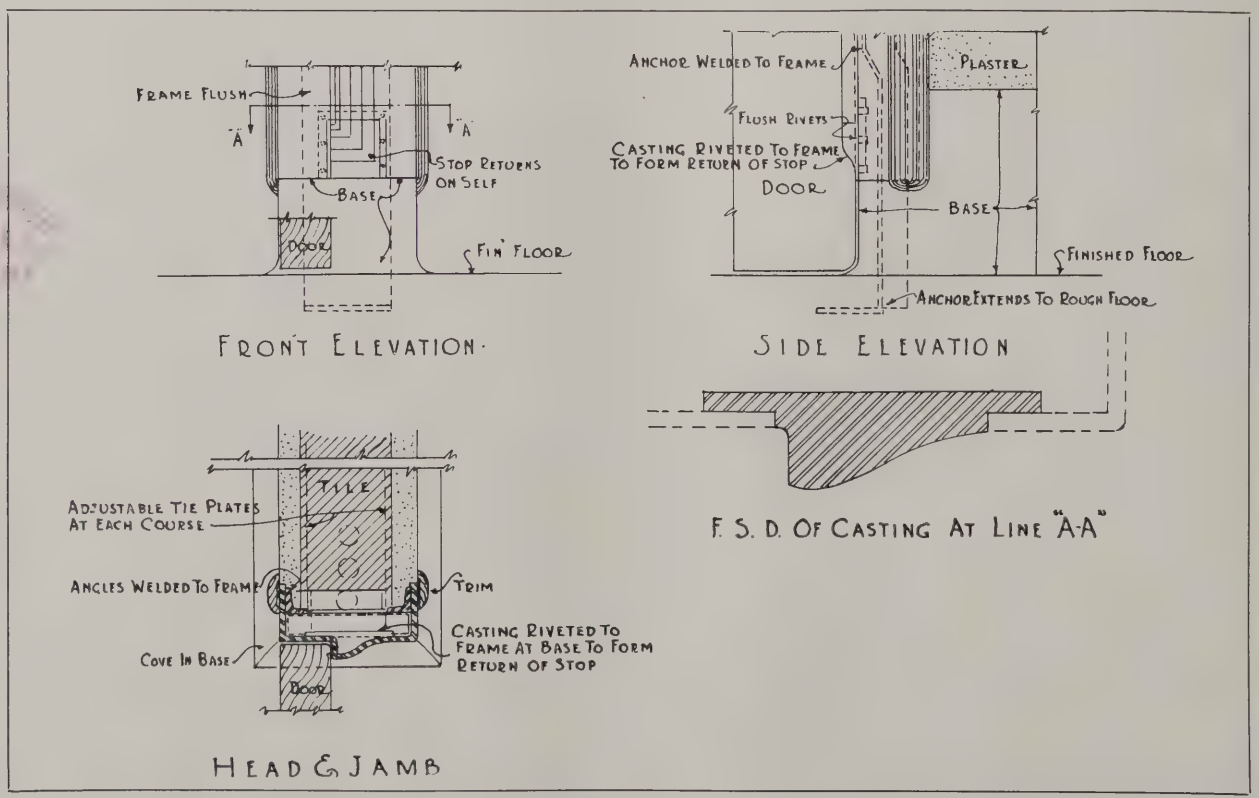

Fig. 1—Section Through Metal Hospital Door Frame, Showing Method of Carrying Wall Base Across the Face of Jamb

lessen the labor of the care of the building and to make it more hygienic from every standpoint. This "rounding" process should be carried out at the floor if nowhere else. The door jamb, instead of being carried to the floor with the rebates and mouldings, should be stopped at the height of the base, and the base material, whatever is used, carried through and the projecting finish, if any, carried to base. If small, it can be limited at the base (see Fig. 1), or if a more elaborate finish is used, finished to a plinth of the base material. Some of the standard details used in the writer's practice are here shown. (Figs. 1 and 2).

Windows form an important function in the lighting and ventilating of a hospital, and their detail is important. The placing of the windows on the plan so as to allow room for the bed without the necessity of crossing the window should be observed. The designing of the window frame and finish so that the room may receive fresh air from outside without producing a draft should always be considered, and where practicable reëntering angles and flat sills should be eliminated. A simple finish (without reëntering angles) may be used. (See Detail, Fig. 4). The sill at the bottom of the window may be straight or projecting above the stool, giving, when the window is slightly raised, a direct-indirect opening for fresh air, the deflection allowing the air to enter without draft. This method also provides for the entrance of air at the meeting rails of the sash. (See Fig. 4).

Doors. The flat or "slab" type doors have become widely used in the up-to-date hospital, and by the use of inlay they can be made as attractive as the more elaborate panel effect. The door frames should be of substantial material to resist the effects of frequent passage of the beds, the wheel stretchers and the food wagons, and steel jambs with or without mouldings have become almost universally used and are considered in the light of economy, although wood jambs in less frequently used doors may be installed. (See Fig. 1). Cabinets and cupboards open and free from contact with walls not only provide for utensils, but make possible frequent and thorough cleaning with the least effort.

Nurses' Stations. Around the nurses' station of the floor should be gathered as closely as possible the various details, such as the linen cupboards, the chart cases, the nurses' call annunciator, and within easy reach, the sink or workroom, the room for cut flowers, etc., and an accompanying cut shows one method efficiently worked out. (Fig. 3).

Sink Rooms, Sub-sink Rooms and Toilets. On all patients' floors the nurses' workrooms, commonly known as the "sink rooms," should be planned with ample spaces for the various details of equipment necessary for a properly functioning hospital,—bedpan hopper, sterilizer and storage racks, the slop sink, the ice box for cracked ice, the hot plate, cup board for specimens for laboratory examination, etc. The smaller sub-sink room need not have elaborate equipment, but merely a toilet for patients, which may be combined with a bedpan washing device, and as circumstances may dictate, a small sterilizer and pan rack. Where sub-sink rooms are placed between wards, the service is greatly simplified. (Fig. 5). Toilets connecting with patients' private rooms are

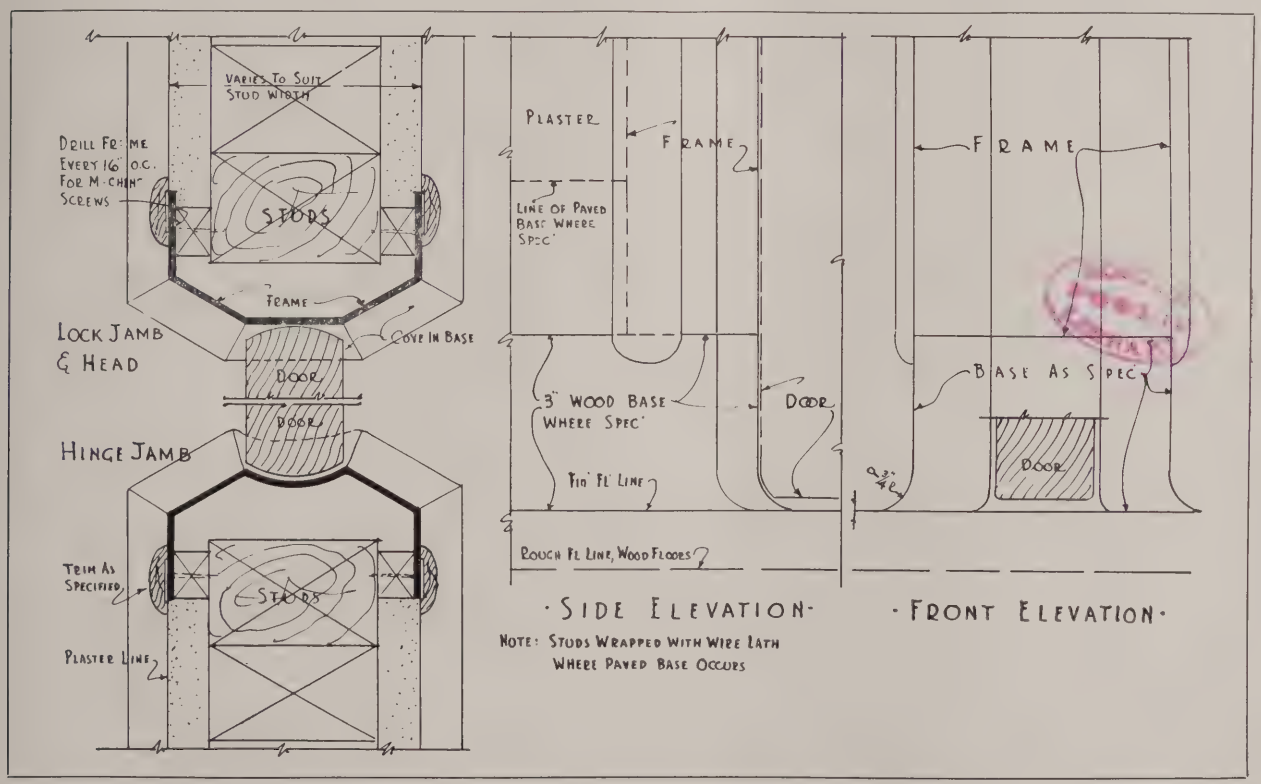

Fig. 2—Double Swing Door Frame, Showing Visual Cut Off at Hinge Side of Door and Integral Base Across Face of Jamb

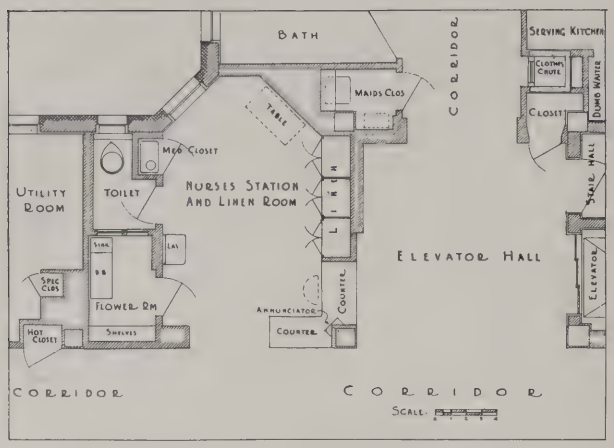

Fig. 3—Nurses' Station at Grosse Pointe Cottage Hospital Showing Proximity to Adjoining Utilities

now looked upon as essential in private room service. These may be for the individual room or with one toilet serving two adjoining rooms, where with special interlocking hardware absolute privacy may be maintained and space and economy in construction gained. With this same plan showers and baths may be used to accommodate either room. (Figs. 6 and 21). Where a bath is desired for infrequent use, one may be planned to connect with two rooms, and by the use of one door only it may be used with absolute privacy to serve each room at will. (Fig. 7).

The increasing demand in the more modern hospitals for smaller units has brought into use cubicle divisions in open wards. These divisions, when considered in making the layout and provided with separate window and heating units, provide a maximum amount of privacy in the ward and at the same

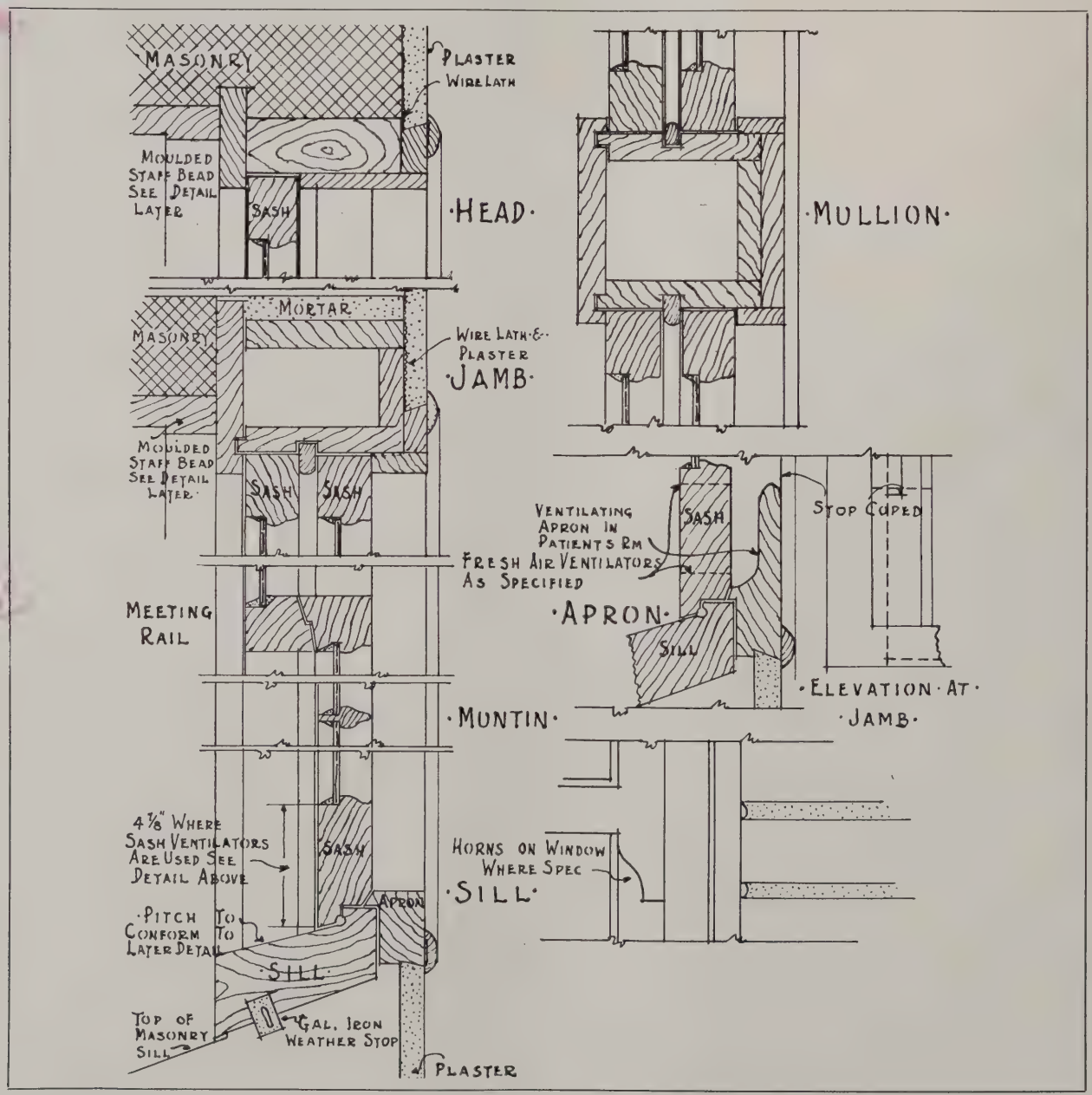

Fig. 4—Detail of Typical Double Hung Window, Showing Ventilating Apron and Simple Method of Finish Against Plastered Wall

time give the nurse complete surveillance of the ward from the nurses' station (Fig. 5), and when provided with sliding panels (Fig. 9) at the bed height it is possible for patients in adjoining beds to "visit" as readily as in the open ward. It is advisable to keep the bottom of the cubicle screen up a few inches from the floor and down from the ceiling for air circulation, and the connecting ties from one cubicle screen to another will provide for separating curtains for complete isolation. The material for the cubicle partitions may be solid plaster on steel frame, steel frame with asbestos lumber panels, or steel frame and panels, but if steel partitions are used, it is advisable to have "filled" panels to absorb the metallic ring of metal. When cubicle partitions are used for children's wards, it is customary to use glass in the upper panels, making possible a more

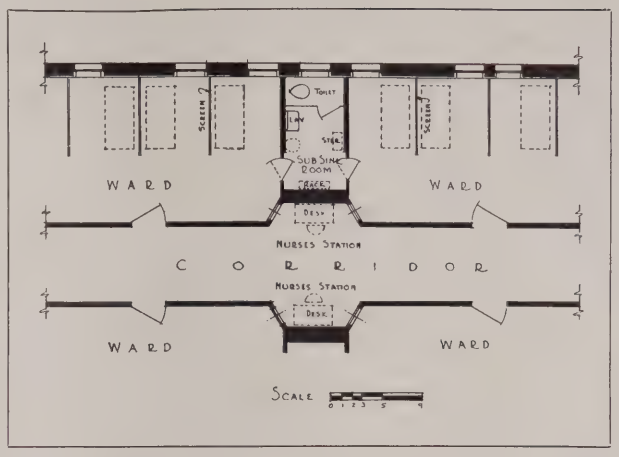

Fig. 5—Small Cubicled Wards, Showing Sub Sink Rooms and Nurses' Station Controlling Two Wards and Corridor

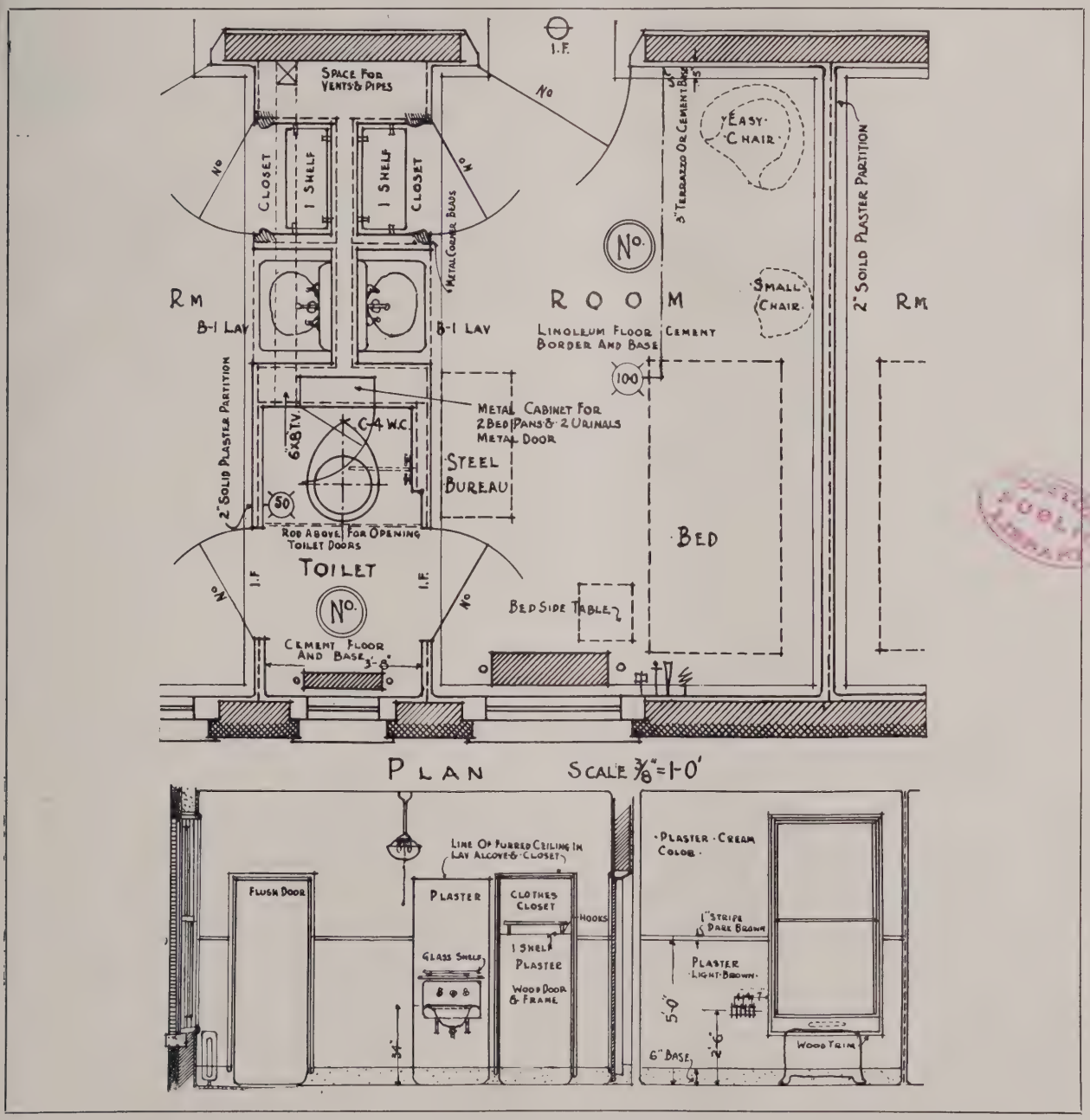

Fig. 6—Typical Arrangement of Private Rooms with Direct Toilet Connection, Showing Bed Pan Washing Device and Metal Cabinet for Utensils

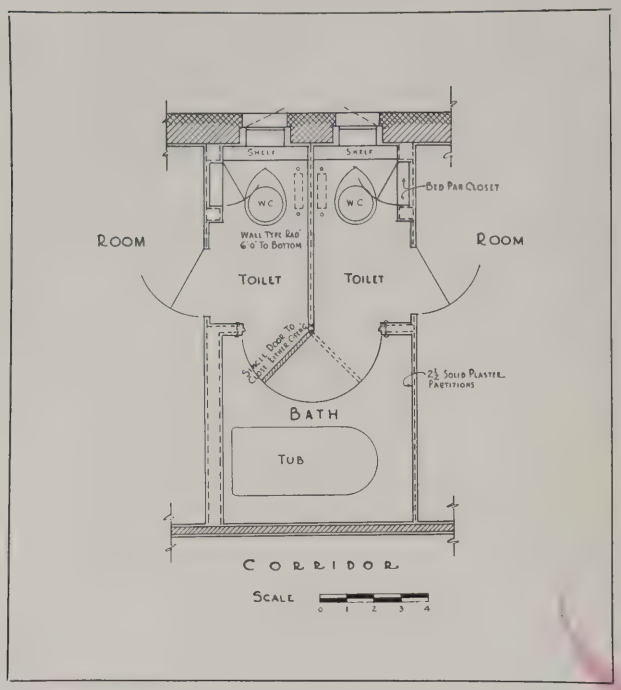

Fig. 7—Plan Showing Private Rooms with Common Bath Controlled by Single Door

Fig. 8—Children's Ward, Showing Glazed Cubicles, Scrub Up Bowls and Corridor Observation Window

complete surveillance of the entire ward. (Fig. 8).

Hardware. The click of metal against metal, whether it comes from the cogs of a motor, the rattle of metal utensils or the action of door hardware, is among the sounds most annoying to the patient, and to minimize noise should be the aim of the architect. There are no more annoying sounds than the clicking of the door latch and bolts to a door. It is common to see the latch bolt "muzzled" by a towel or a rubber strap, but some of us think the latch bolt may well be eliminated in the construction and the door be held in place by a silent roll striker or by a self-closing, silent door check. The use of the friction hinge, or friction drag, for holding the door in any position and preventing slamming, sometimes accomplishes the same results. Whatever be the hardware used, it should be possible to enter and leave the patient's room noiselessly, and with the hands otherwise occupied; with this in view, use of the hook handle (Figs. 10 and 11) has given universal satisfaction. With the use of the self-closing check it is necessary to provide some "hold back" device, but it should be so applied as not to interfere with the ready opening of the door. Where it

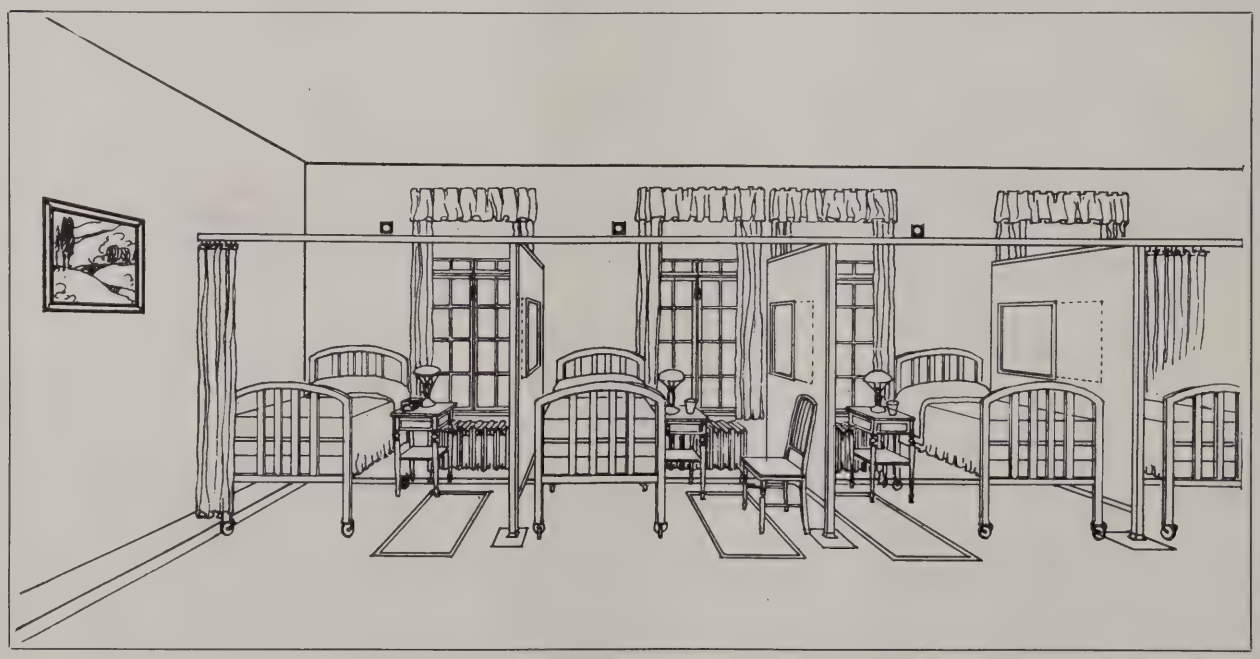

Fig. 9—Detail of Cubicle Partitions, Showing Inter Communicating Slides at Head of Bed

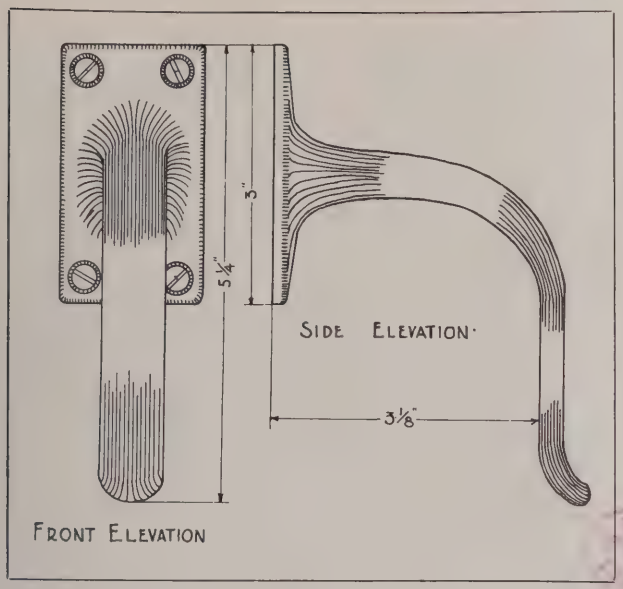

Fig. 10—Elevation of Hook Handle Used for Patients' Doors

Fig. 11—Interior Playroom, Grosse Pointe Cottage Hospital

is desired to swing the door in both directions, the floor checking hinge may be used to advantage, and by using a concave jamb on the hinge, the sight line at the hinge side is cut off. (See Fig. 2).

The noise from the elevator doors often causes great annoyance, and as these can be made to work without noise, great care should be used in the selection of the elevator fronts as well as of the elevator doors. As the openings in the hospital elevator must be wide enough to allow the passage of 3-foot beds, the three-fold sliding door would seem to be the most practical. There is no more important detail in the hospital than the elevator, for upon its smoothness of working, reliability and finish depends the comfort of the patient during transit from one floor to another. The possibility of securing perfect landing, exactly level with the floor, so that beds may be rolled from elevator to corridor without a jar, is to be desired, and the extra cost of necessary equipment is warranted in most cases.

Heating. Insofar as the system of heating is concerned, whether it be hot water or steam, direct, indirect or direct-indirect, choice depends largely upon the type of hospital, climatic conditions and the clients' pocketbooks, but the extent of exposed surfaces of heating units should be considered along with other hospital details. If exposed radiators are used, the surfaces should be easily cleanable, and if set up on single legs or hung from the walls, the ease of cleaning is greatly facilitated (Fig. 12). The use of the direct-indirect radiator allowing for the introduction of fresh air and also ease of cleaning, has been made in certain localities where a greater amount of fresh air than can be admitted by the window is needed. This method of heating is particularly adapted to the operating room, where the

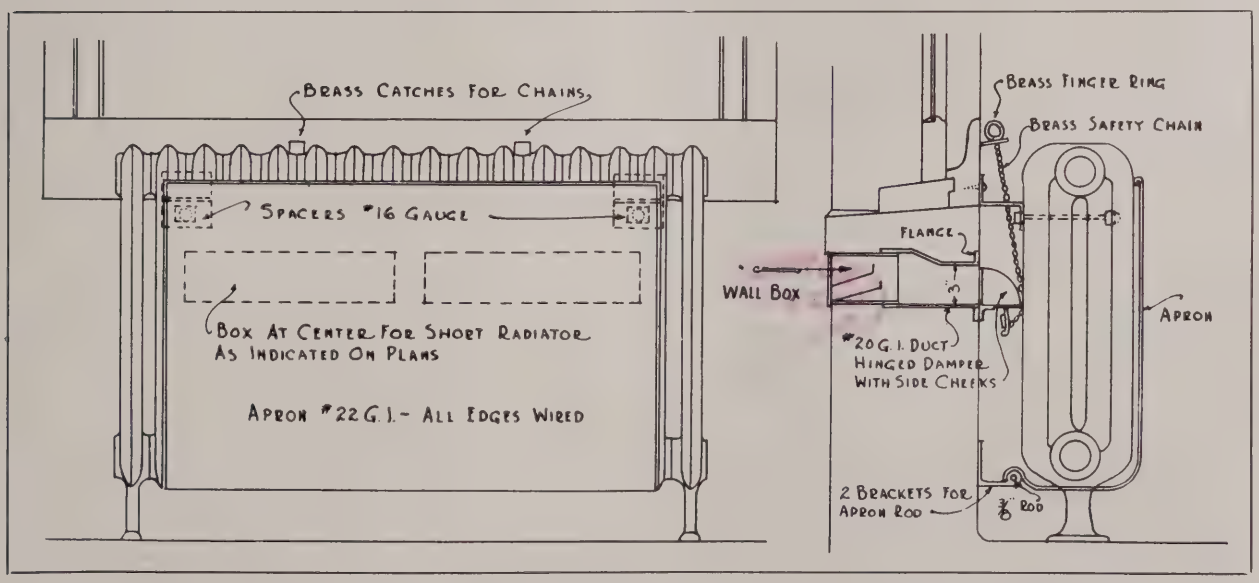

Fig. 12—Detail Showing Fresh Air Duct, Dampers and Method of Supporting Radiators

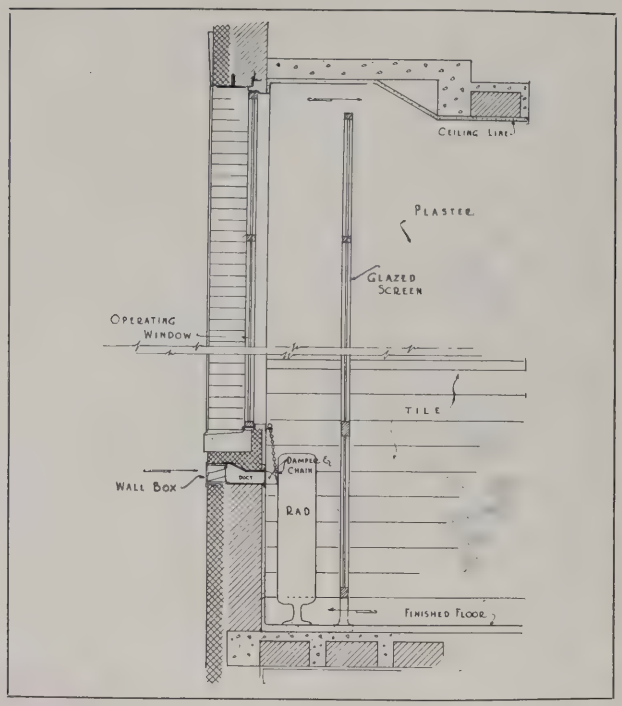

Fig. 13—Operating Room Window, Showing Method of Heating and Ventilating

Fig. 14—Central Surgeons' Scrub Up Basin, Showing Elbow Valve, Spray Nozzle, Etc.

radiator may be placed between the outer window and the window screen. (See Detail Fig. 13). Where ventilators occur, for the sake of hygienic cleanliness, it is the opinion of the writer that all grilles and register faces should be omitted and the ducts finished like the wall, and "get-at-able" at all times for cleaning.

Plumbing. A volume might be written on hospital plumbing, from the sewer to the last spigot, but as this subject is covered more fully elsewhere in this issue of THE FORUM, and as the writer is touching only on details and presumably interior details, he will mention a few only of the hygienic precautions which should be taken, and these are illustrated with a few diagrams. The most common piece of plumbing that may be used in every patient's room is the basin, and as this basin is used by the patient, the nurse and the doctor alike, it should have all of the elements for carrying out the strictest hospital technique and should have (*a*) absence of a concealed overflow, (*b*) possibilities of cleaning the drain pipe to the waist line of the trap, (*c*) possibility of drawing hot or cold water through an outlet sufficiently raised above the bowl to allow of filling pitcher or basin, and (*d*) control valves which may be when needed controlled by elbow or wrist. Such a basin simply made should be placed in every patient's room, dressing room and wherever water for cleaning the hands is needed in the hospital.

Fig. 15—Detail of Private Room Toilet, Showing Bed Pan Washing Device

The surgeon's scrub-up bowls may be more elaborate with sprinkler head and large elbow valves (Fig. 14), but with the same principle of construction. Fixtures with "integral overflow," "pop-up waste," fixed standpipes, or any device which could allow a "flow back" from the previous contents of the fixture, should be avoided and the plumbing should be laid out to avoid any possibility of there being syphoning of sewage water into the fixtures or into the water supply. This precaution is very vital in connecting the sterilizers to water and drain systems. In no case should the water and drain connection be made through one pipe. The water should be brought over the top of the sterilizer. In many of the English hospitals the drain of the sterilizers, or any fixture in the operating section of the hospital, drains to an open gutter and thence to the house drain. With water sterilizers this pre-

Fig. 16—Infants' Ward, St. Luke's Children's Hospital, New Bedford, Mass., Showing Glazed Cubicles and Scrub Up Bowl

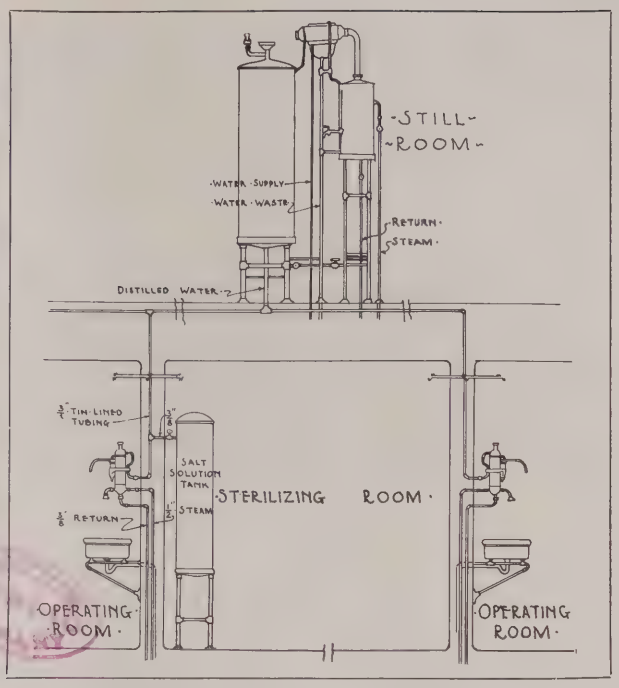

Fig. 17—Section Through Typical Water Distilling Plant for Supplying Distilled Water to All Surgical Connections

caution is more essential than with boilers, and the writer believes that the interests of the hospital are safeguarded to a greater extent if all water used for surgical and drinking purposes is first distilled and conducted by gravity through sterilized pipes to various parts of the institution and locally re-heated or re-cooled for use. (Fig. 17). The autoclave or pressure form of sterilizer is now being used very largely for instruments and basins, and when it is "built-in," very little heat is thrown out.

Sound. While the writer has mentioned some of the visible details which go to make up the efficiency of the hospital, the invisible detail of providing for a certain amount of sound absorption adds so materially to the comfort of the patient that providing it is unhesitatingly recommended. This subject is treated more fully in another article in this issue. Sound absorption may be effected either by wall or ceiling treatment, but the use of absorbing material on the walls is subject to more or less objection, owing to its being of necessarily porous material,—it has been found that if the ceilings, which are less likely to collect dust, are treated, a sufficient amount of absorption is effected to make the hospital quiet for patients. It is as great a mistake to reduce the institution to the state of absolute quiet of oppression as to have it too noisy. For the purpose of securing this sound absorption, various materials consisting of loosely pressed fiber of cane, of mill shavings, of felt, etc., are used in slabs and fastened to the ceilings; or materials in the form of plaster of a fibrous nature. All have their value, for if from 30 to 50 per cent of the sound waves are absorbed, very little disturbance is felt. It has been found that if the ceilings of the corridors, the sink rooms, the serving kitchens, nursery, etc., are protected, there is little need to carry the protection very far elsewhere, for the disturbing noises of the hospital emanate from these sources,—from the washing of utensils, from the crying of infants, from the clicking of hardware, and from thoughtless talking in the corridors.

Color and Decoration. With the detail ever so fine, the floors ever so smooth, the air and the water ever so pure, the absence of color may mar the psychological effect on the patient, so that use of

Fig. 18—Nurses' Station, Showing Chart Desk, Nurses' Annunciator, and Linen Cupboards

Fig. 19—Central Nurses' Station, Showing Nurses' Call Annunciator; the Charting Cases Are Within the Enclosure

Fig. 20—Cubicles, Scrub Up Bowls, General Ventilation and Decoration of a Hospital Ward

color,—and the *proper* color,—becomes most essential. Upon this use of color depends largely the "beauty of the hospital," as was so fittingly expressed by Father Moulinier at a recent meeting of the American College of Surgeons in Boston, but as this subject is being discussed elsewhere in this Hospital Reference Number, the writer will be pardoned if he refrains from going further into the subject. One example is shown, however, of the possible decoration of a children's playroom (Fig. 11).

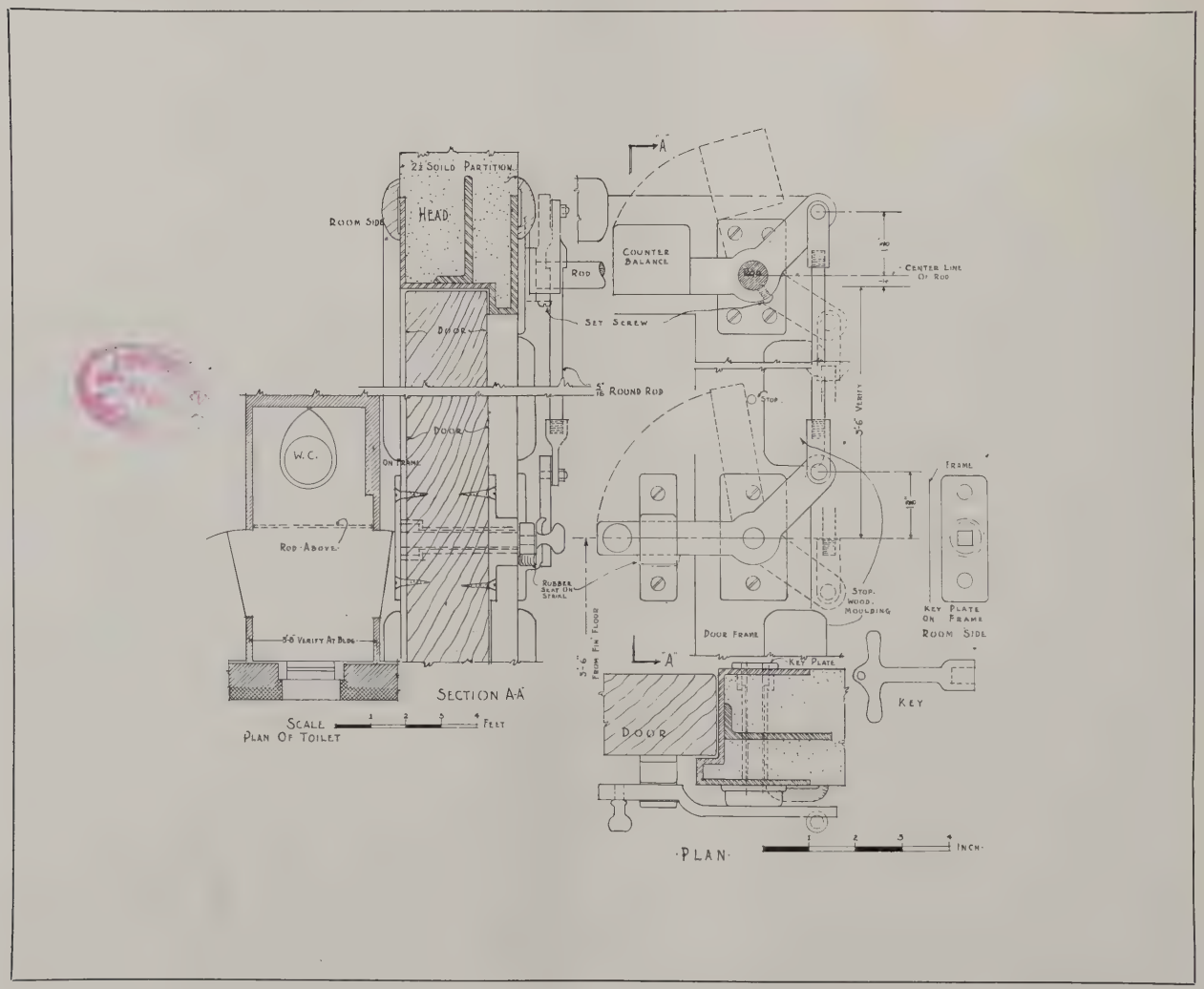

Fig. 21—Detail of Hardware for Toilets to Connecting Rooms, Securing or Releasing Both Doors at One Movement of Handle

HOSPITAL CONSTRUCTION IN WARM CLIMATES

BY
MYRON HUNT, ARCHITECT

THE logical reasons which usually underlie the decision to erect a tall building, for any use whatsoever, might be said to be caused by a restricted site; the high valuation of land; the saving of expense, particularly when construction and floor resubdivision story by story can be standardized; the cost of foundations in cold climates, where frost extends 4 or 5 feet into the ground; the conservation of heat rising through the building; modern fireproof engineering and construction methods; and not the least of many considerations, the possibility of capitalizing the modern freight and passenger elevator.

In planning even a small hospital in a cold climate a sufficient number of such considerations will usually obtain to indicate a vertical rather than a horizontal development. In perhaps one third of the area of the United States, however, climatic conditions, with lower average land values, are such as to warrant the serious consideration of the advantages of one-story construction in the erection of a small hospital of say 100 beds and less. Some 20 years ago the writer built in Los Angeles County the first California school building planned on a large scale as a wholly one-story structure. It proved a success as a general scheme. Today in the country districts of the southwest, and largely in suburban districts, the one-story elementary school with its unglazed outside corridors in the form of long porches and its ventilation on two sides of every room, is quite the general rule. There is an actual reason for the California "bungalow," as there has proved to be good reason back of the erection of moderate-sized one-story schools, libraries, and more recently hospitals, in the southwest. Frost extending deep into the ground need not be provided against. Steam heat and its conservation are of less importance than the desire to produce airiness and the desire to move from the garden or grounds into any part of the building at will; and no snow drifts are encountered to make it necessary to set the first story high above the ground level. Under the conditions just suggested, the original expense can actually be reduced, and the upkeep cost of stairways and elevators may be eliminated; the land area, however, must be greater; contemplated expansion can more easily and economically be provided for, and the hospital can be made to look less institutional,—more domestic.

The spread-out plan, even for a 60- to 80-bed hospital, would at first appear to be probably a financial luxury, and certain to involve much walking from department to department. Experience,—the actual measurement of the average number of steps to be taken by the staff,—has, however, proved otherwise, up to 80 and perhaps, on some sites, 100 beds; this means up to a size which necessitates two nursing stations, and in some cases for three such executive centers of nursing activity. For instance, let us take the one-story building at Riverside, built as a two-station, 70- to 80-bed hospital with plans for future expansion, if need be, to a three-station hospital, caring for from 100 to 120 beds. This might have been considered vertically in a cold climate, perhaps as planned in this way. Basement: heating plant; refrigeration and other mechanical apparatus; incinerator; mattress sterilizer; laundry; storage; perhaps the morgue, etc. First story: perhaps the kitchen with its various adjuncts, including the service dining rooms which should perhaps have occupied more space than might have been available; emergency receiving and executive offices. On this floor, unless it had one-story wings, it would have been impossible to have included various desirable local stores; the physicians' and nurses' locker rooms; social service department; and certainly there would not have been space for physiotherapy, which, with its necessity for easy access from the street and the necessity of looking toward possible and almost certain extension, should not be tucked away in the basement. The second story would perhaps have contained from 28 to 33 medical beds. The third story might have contained the maternity department, which however, would have had to be cut down to fewer beds than would have been needed if the creche and its adjuncts, and particularly if the labor and delivery rooms, were kept on the maternity floor. The fourth floor: surgical beds. Here conditions in the community were such as to seem to require more surgical beds than beds for any other department, and a standard vertical building would not have had the surgical beds all on one level. Fifth floor: operating unit, with various laboratories and surgical work rooms, with perhaps labor and delivery rooms. Sixth floor: doubtless a sun parlor; and an intermediate seventh floor could easily have been argued for in order to take care of expansion which could not have been taken care of economically by the future additions horizontally in any vertical scheme or plan.

If it had proved desirable, in the Riverside problem, to put their requirements into a five-, six-, or seven-story and basement building, the difficulties to be solved from the standpoint of the inter-relationship of departments might be enumerated as arising from:

1. The desire to keep the kitchen and all service dining rooms out of the basement in a climate and locality where land valuation has developed no sufficient precedent for the basement arrangement; in other words, where it would have been very unpopular, as well as inconvenient.
2. The desire to get the out-patients' department, and the present with the future expanded physiotherapy department, where they would be accessible

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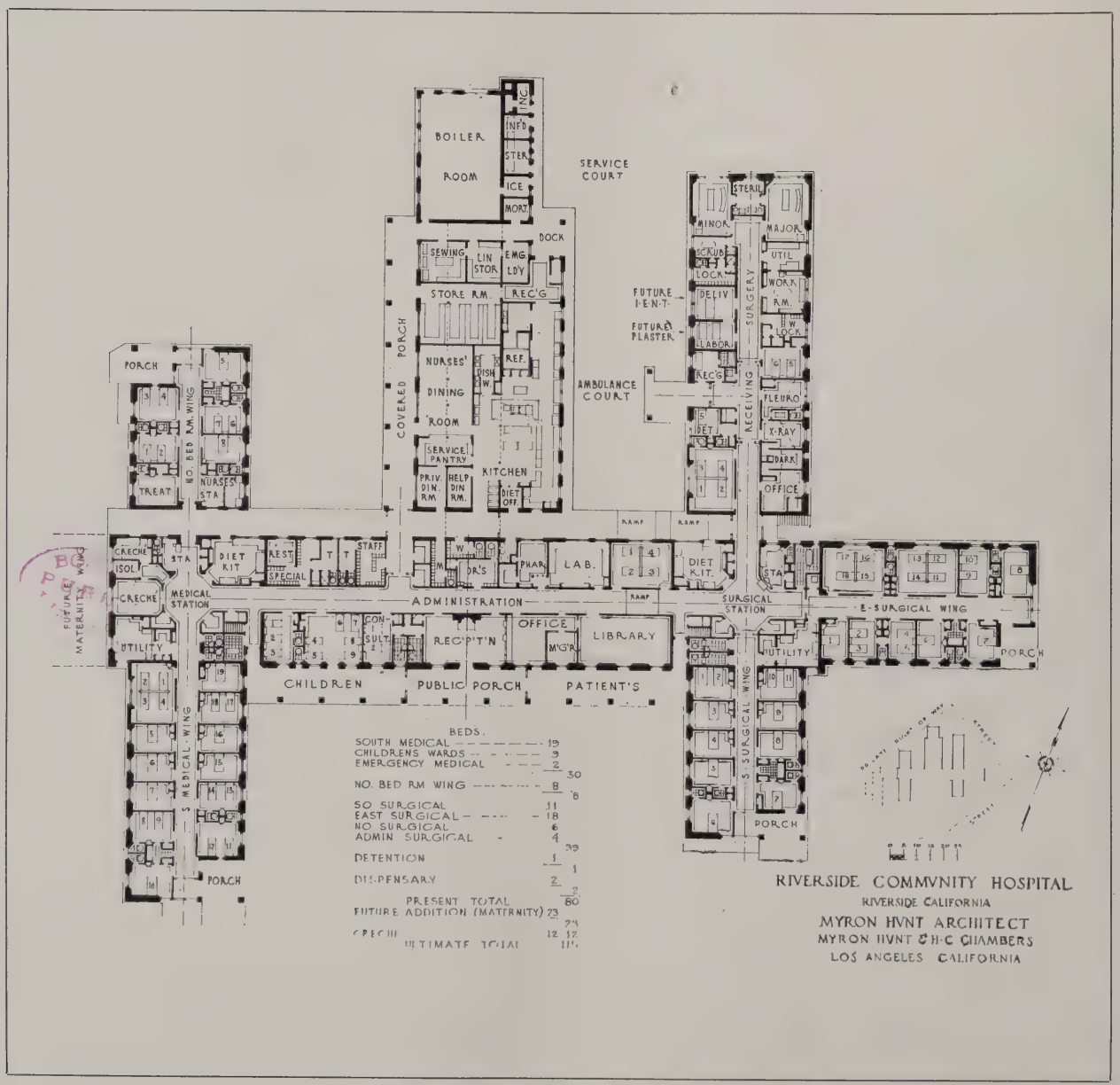
RIVERSIDE COMMUNITY HOSPITAL, RIVERSIDE, CAL.
MYRON HUNT, ARCHITECT



from the street. It is, however, to be noted that in this particular instance a hillside location was utilized, and these departments are in reality in a wholly exposed basement.

3. The desire to have in this community an emergency operating and receiving service separated from the main operating room unit, even in this small plant, although it continues to be adjacent to the regular surgical nursing service group.

4. The desire to have the X-ray and other laboratories close to both the emergency and regular operating units.

5. The desire for a large central first-story room for use not only of the board of directors, but also for the use of the local medical society.

6. The desire to get physicians' and nurses' rest rooms and also the dieticians' office near the central executive control.

7. The desire on the part of the board of directors of the hospital to provide an osteopathic unit which was to be in the building separate from the main structure, but with food service from the main kitchen.

8. The desire to have surgical beds on the same floor as the operating rooms, coupled with the apparent necessity for a larger number of surgical beds than of either medical or maternity, at present.

9. The desire to provide economically for a future maternity unit which should add 40 or 50 per cent to the total bed capacity at present required.

10. And the natural and usual desire to keep the ward corridors from being general utility and visitors' runways.

The climatic opportunity being assumed, it appeared possible to solve more of these problems in a one-story than in a many-storied plant and, strange to relate, at less expense despite the use of good construction. This expansible community hospital, general in type, carrying some 80 beds, was actually built for substantially $3000 per bed, and when the plant is some day completed, the per bed cost will be cut another $250 or more. This was accomplished in a small general hospital, in which, if one segregates the actual square foot area that is available to be occupied by patients (wards and patients' rooms), and sets this area against all the areas otherwise used, one will find that the 80 beds occupy only 22½ per cent of the floor area of the entire hospital.

This always seems incredible, but a check of any reasonably complete general hospital of from 150 beds down to 70 beds, with all the departments to some extent represented, and all the space taken into account (that the visitors and the physicians and even the nurses seldom see,—but which must be counted in), such a check will seldom show that the actual rentable patients' space will exceed more than from 20 to 25 per cent of all space. Corridors, nursing units, kitchens, boiler and incinerator room, laundry, executive, storage, and out-patient departments, in addition to stairways, elevators, surgery and many minor units, add up in area enormously. Naturally this statement does not apply to a special hospital or to hospitals, which, not being general community hospitals, do not have at least the rudiments of the numerous departments which go with even a small general hospital, erected to supply as nearly as possible all the requirements of a district.

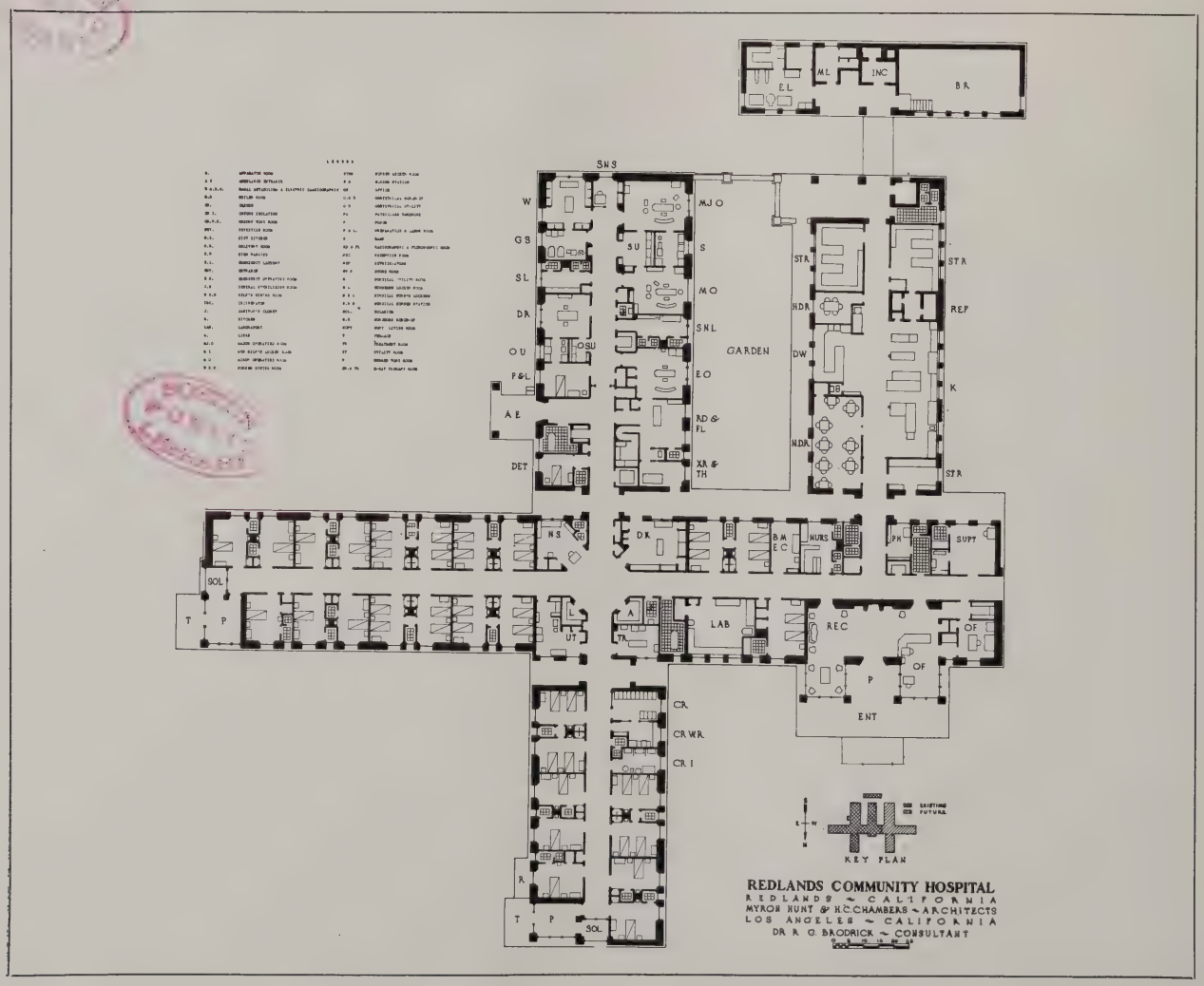
Since the erection of the Riverside Hospital, two others have been developed,—that at Upland (The San Antonio Community Hospital), and one now being built at Redlands, along similar lines. One is smaller and the other practically the same size as the Riverside. One has fewer departments, offices and social requirements, and the other has more such general units. More bed space per total area has been obtained, but only by curtailing units which seem more or less necessary in a self-contained and complete community hospital.

The construction of these buildings is: (1) reinforced concrete for foundations, exterior walls and for all that portion of the basement which extends above ground and is completely lighted; (2) concrete floors throughout, with terrazzo finish and cement base board; (3) concrete porches; (4) metal trim at door openings; (5) tile roofs; (6) interior partitions, except for cross wall fireproof partitions at intervals, made of wood studs with metal lath and plaster,—this wood, of course, a compromise, largely justified however by the comparative safety which comes with a one-story building.

The amount of area saved through the elimination of stairways, elevators, and fire escapes added some 15 per cent to the number of beds that would have been available had these structures been worked out vertically. This method of one-story attack upon the small hospital problem has also been used by us at Artesia, at the Boys' and Girls' Aid Society at Altadena, in the Pasadena General Physiotherapy Building and Dispensary, and in the Pasadena City Contagion Hospital.

Sufficient experience is available to show conclusively that in warm climates and within certain limitations, economy of construction and of operation and efficiency in general may obtain in such hospitals. The principal characteristic of the construction of these buildings is a thick, hollow, reinforced concrete exterior wall, affording fire resistance from the outside, an appearance of stability as in the case of the early buildings of California, and insulation as a result of the hollow in the thick exterior wall. Such a wall is composed of a 4-inch outer wall of reinforced concrete and a similar 4-inch inner wall with cross-webs at windows and at intervals in long unbroken walls, leaving a hollow space which reduces the cost of construction and has proved to be magnificent insulation against heat from without and at the same time a great conserver of artificial heat within. The construction is carried on through the use of collapsible forms in the case of these hollow walls. It has been developed to such an extent through the southwest, since the building by the writer of the Flintridge Country Club ten years ago, that it has become a standard method of construction.

SKETCH OF COMPLETED REDLANDS COMMUNITY HOSPITAL, REDLANDS, CAL.
MYRON HUNT AND H. C. CHAMBERS, ARCHITECTS



PROVIDING FOR HOSPITAL EQUIPMENT

BY
H. E. HANNAFORD
OF SAMUEL HANNAFORD & SONS, ARCHITECTS

THERE is probably no type of building in which the matter of planning for equipment plays such an important part as in a hospital. The planning of the building itself is highly complicated, and the purposes of the hospital, down to its minutest details, should be definitely pre-determined with the architect by those who will subsequently operate and manage the building. Each separate department should be allocated and arranged in accordance with its proper functions, and these functions must be clearly visualized. It is always preferable to have in charge of the work an architect who has had thorough hospital experience and who is fully conversant with departmental needs and hospital technique in all of its phases and who understands the equipment.

If a hospital is to render complete and intelligent service, the matter of equipment becomes one of paramount importance, and all equipment items should be considered as an integral part of the building and should be taken care of in the original planning and not left for subsequent consideration. For the purpose of this article, it is not our intention to consider the mechanical plant,—ventilating system, ordinary plumbing fixtures, elevators, plant for mechanical refrigeration, clock system, telephone system, nurses' and doctors' call system, linen chutes and incinerators,—as equipment. While it is true that all these might perhaps be considered as equipment items, they seem to the writer to be more parts of the building itself, and the subject matter of this article will be confined to other types of equipment.

Equipment seems to classify itself logically into two general types: 1. Built-in or fixed equipment, requiring structural provision to accommodate its proper placing in the building, or requiring plumbing, heating, ventilating or electrical connections to make it effective. 2. Movable equipment (which is usually just as essential as built-in or fixed equipment), the position of which must be accurately pre-determined and proper floor or wall space allowed for its subsequent placing. In general, *built-in or fixed equipment* items consist of kitchen equipment; laundry equipment; refrigerators; laboratory and pharmacy equipment; built-in cases, counters, bins and shelvings of all kinds; sterilizing equipment; special plumbing fixtures (such as plaster sinks, disposal sinks, bed-pan washers, infants' baths, etc.); X-ray equipment; physio and hydrotherapy equipment; lockers; instrument cabinets; dental chairs, etc. *Movable equipment* items are, in general, beds; dressers; chairs; desks; movable tables; filing cases; operating tables; examining tables; basin, instrument and irrigator stands; anæsthetizing equipment; dressing stands; bassinets (in the nursery); tray cars (in the kitchen); sorting tables and truck tubs (in the laundry); and a host of other items, all vitally necessary to the successful functioning of the hospital, and for which places must be found and proper provisions made.

From the foregoing, it can be readily seen that the matter of pre-determining the location of and providing for all equipment items becomes a matter of tremendous importance. It is not good practice, ever, to assume a room or department size and then try to put the equipment in it. The use of the room must be definitely foreseen and the equipment arranged so as to function to the best advantage in the most economical space, and from this arrangement the room size can then be determined and made a part of the finished plan. To illustrate this point, let us consider a small X-ray suite and its equipment. First of all, the walls (and also the floor and ceiling of patients' rooms below and above the X-ray department must be lead-lined; doors must be lead-cored; windows must be provided with lightproof shutters or shades. The equipment to provide for consists of the X-ray machine proper; control room; a radiographic and fluoroscopic table; plate changer; stereoscope (for viewing of films); film storage cases; provisions for overhead high-tension wiring, etc. In the dark room in connection with the X-ray department, provision must be made for a five-compartment developing sink (with hot, cold and ice water supplies); work counter with film and chemical storage space below; film rack for drying films; fan for film drying; five electric light outlets provided with light-safe fixtures; light-tight, lead-lined transition box in wall between dark room and X-ray room to permit passage of cassettes containing exposed films to dark room for developing. Provision must be made for dark room with automatic sprinkler system. The foregoing are minimum requirements for a very small X-ray department, and the architect should work with the Roentgenologist of the hospital in laying out this department so as to provide for every equipment item necessary for this important department.

Movable equipment is very often closely related to other equipment, and the proper arrangement and location of the movable equipment are very important. Frequently one goes into a hospital where the matter of purchasing and placing equipment has been left to a later time, and one sees then the real importance of giving the equipment consideration along with the general planning of the building. This is particularly true with such pieces of equipment as require water, waste, vent, steam or electrical connections, as these connections should be located and run at the time of constructing the floor slabs and installing the partitions. By following this procedure, a tremendous amount of subsequent cutting, and patching, with their resultant "extras," will be eliminated, and the

Fig. 1. Main "Centralized" Type Hospital Kitchen

Fig. 2. A Small Floor Service Pantry

equipment will fit into the finished building in a neat and orderly way.

All of the matters discussed in the foregoing paragraphs may seem so obvious as to make them practically unnecessary, but the writer has seen so many hospitals in which, for some reason or other, the matter of equipment was not given consideration at the time the general drawings were made, that it seems advisable to touch upon a few of the more important points in connection with planning both the building and its equipment as a unit. Equipment will not "just place itself," and inasmuch as it is a vitally important part of the building, there seems to be no reason for not taking it into consideration at the very outset of the problem. As was said before, it

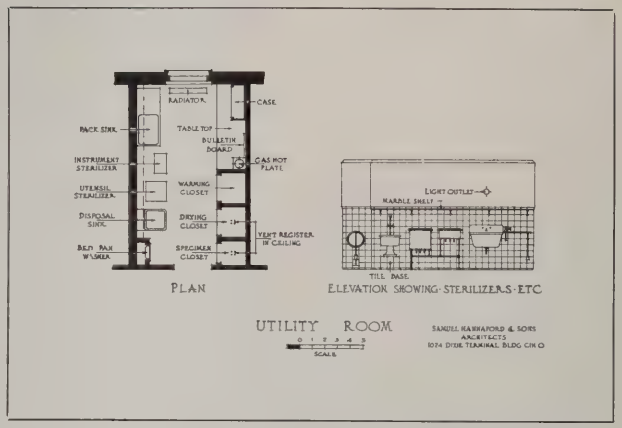


Fig. 3. Utility Room on Patients' Floor

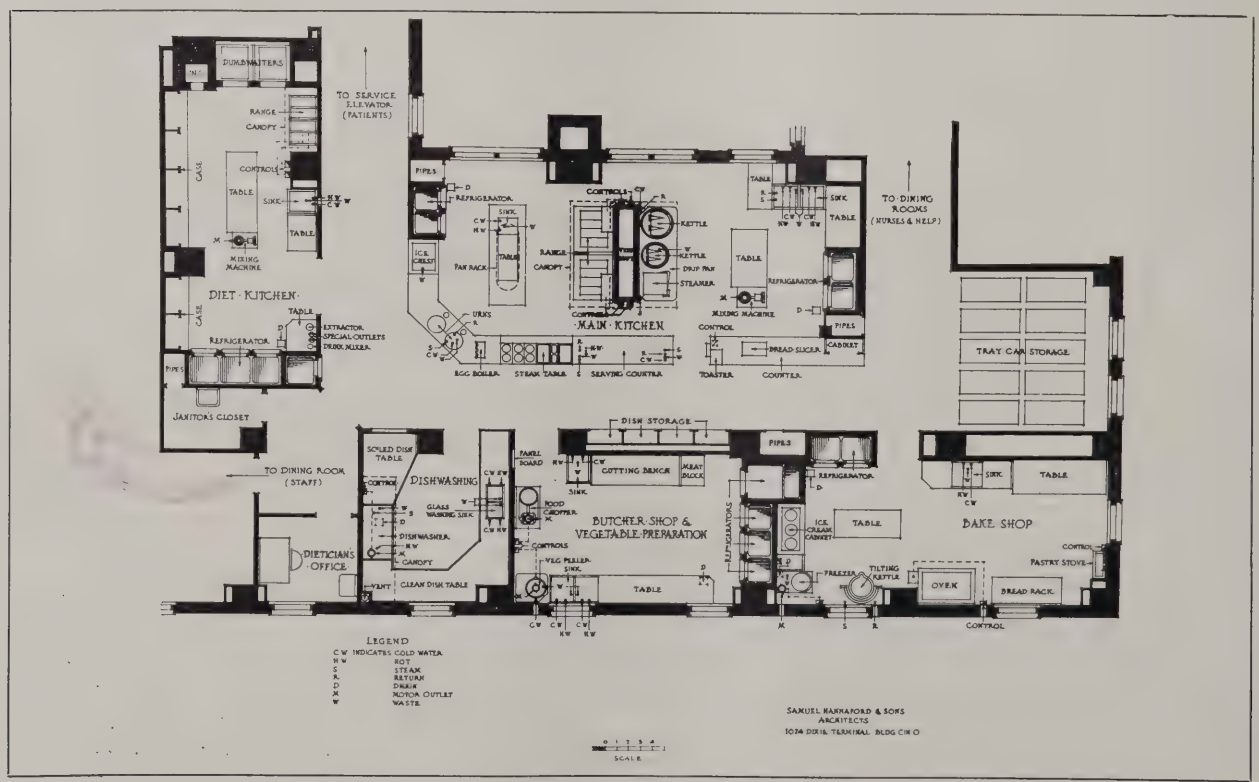


Fig. 4. Plan of the Kitchen Shown in Fig. 1.
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Fig. 5. A Typical Private Patient's Room

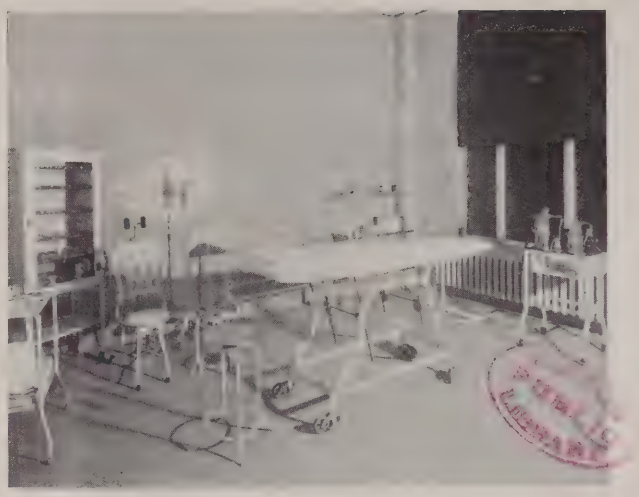

Fig. 6. A Typical Minor Operating Room

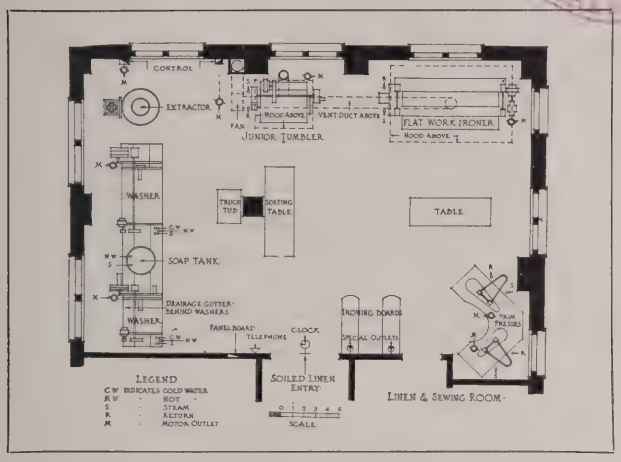

Fig. 7. Plan of Laundry, Showing Equipment

is bad policy to establish room sizes and shapes arbitrarily and try to get the equipment in afterwards. The consequences of this method of procedure are usually that either the room is unnecessarily large, thus wasting cubic contents and increasing maintenance expenses, or the room is so small as to develop cramped and poorly arranged equipment, thus cutting down the efficiency of the room and involving consequent maintenance cost, due to this decreased efficiency. This point seems of sufficient importance to warrant its being given emphasis in this article.

One of the fundamentals in developing any hospital project is, in the writer's opinion, an early determination of the administrative and operating policy of the hospital. This should be most carefully

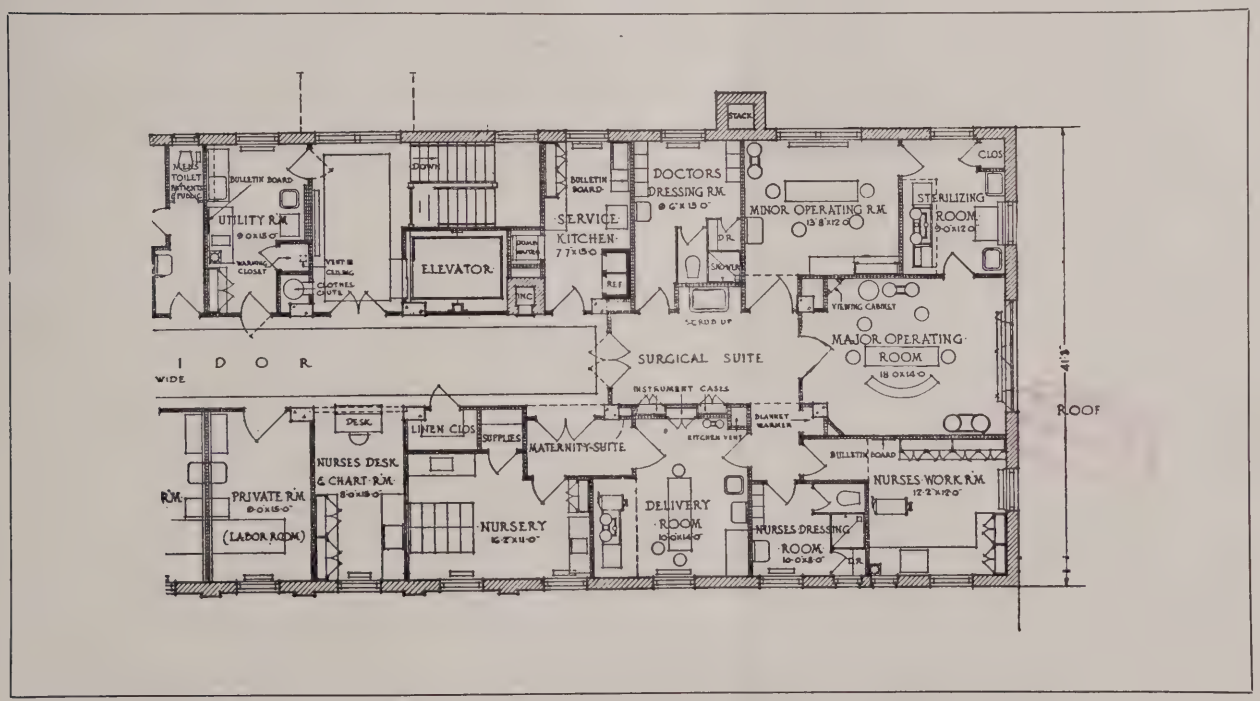

Fig. 8. Plan of Typical Operating and Maternity Suites

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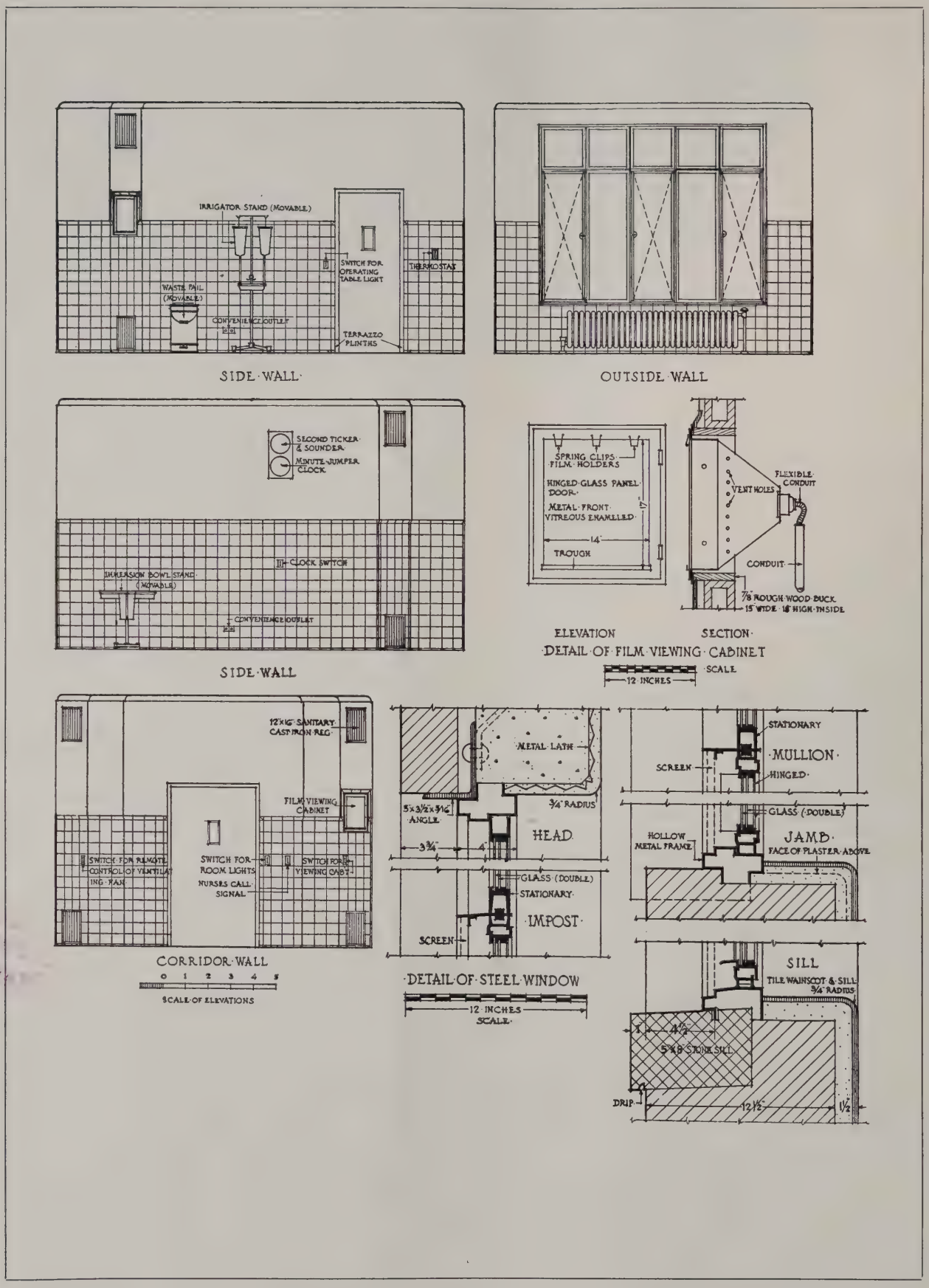

Fig. 9. Elevations and Details of a Typical Major Operating Room

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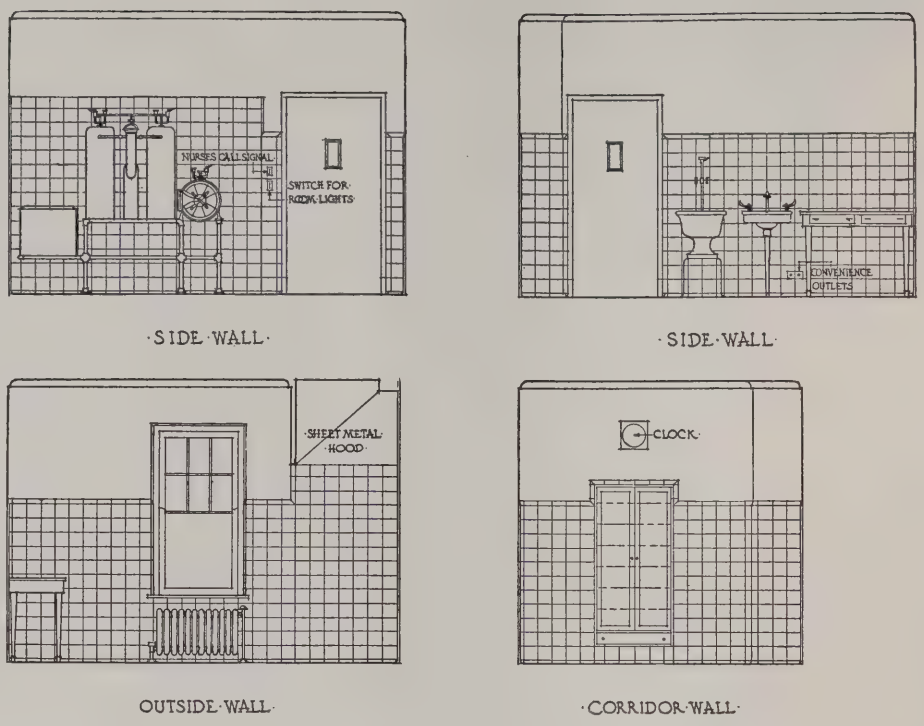
worked out by those who will be entrusted with the hospital's management; and this policy, once established, should be rigidly adhered to. This predetermination of policy has a very important and definite bearing, which cannot be overstressed, upon every least portion of the hospital building. As a rule, when one sees a hospital which has been planned without a completely pre-determined administrative and operative policy, one sees a hospital which is not functioning as it should. Its arrangement is probably not efficient, the equipment has not been properly thought out or located, and the entire building seems unsatisfactory. The fault would appear to lie in two quarters: 1. Those who were to have the management of the hospital in their charge failed to visualize the administrative program and consequently failed to anticipate the needs of the various departments. Or (2) the architect employed did not have sufficient hospital experience to know what the various departments would require, and was not aware of the vital importance of planning for equipment and planning to meet the requirements of a definite administrative policy.

The various illustrations in connection with this article are designed to show some of the salient features discussed herein. Figs. 1 and 4 show the layout of a main kitchen of an average-sized hospital. The type of food service determined upon by the hospital authorities was, in this case, the "centralized" type, using food trucks from the main kitchen and distributing trays from these trucks to the various patients' floors. This was an important decision to make, as it naturally affected the general kitchen layout. By properly studying the kitchen service, the equipment was placed and all service connections of every sort run to proper locations as the building progressed. A great deal of equipment was designed to be set up on sanitary bases having tiled facings, and the sizes and locations of these bases were pre-determined and the bases constructed before the equipment was delivered. The completed kitchen is very efficient and satisfactory, and all equipment was placed and connected up without any changes, cutting or patching whatever.

Fig. 2 shows a small floor service pantry in the same hospital as the main kitchen just described. Inasmuch as the central tray service system of food distribution had been determined upon, these floor service pantries could be greatly reduced in size, as there is on actual preparation of food in this pantry for the various patients. The sizes and shapes of the rooms were determined entirely by the equipment layout, and all provisions to receive equipment and all service lines to properly service the equipment were installed as the building went up.

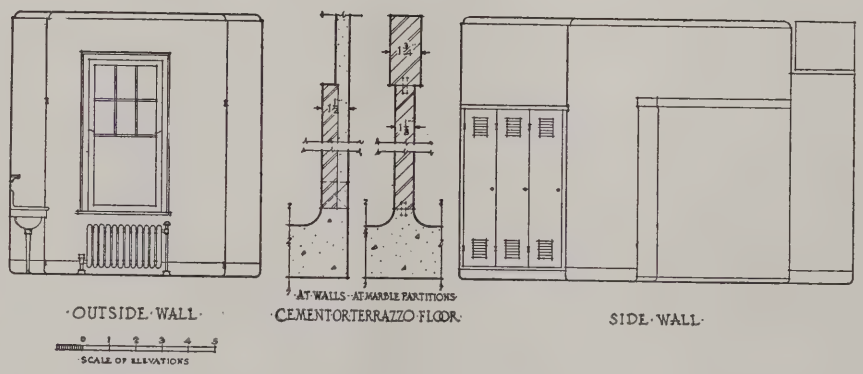
Fig. 3 shows a typical utility room on a patients' floor. Here again all equipment was carefully laid out; the size of the room was determined from the equipment arrangement. The other illustrations are practically self-explanatory in showing equipment.

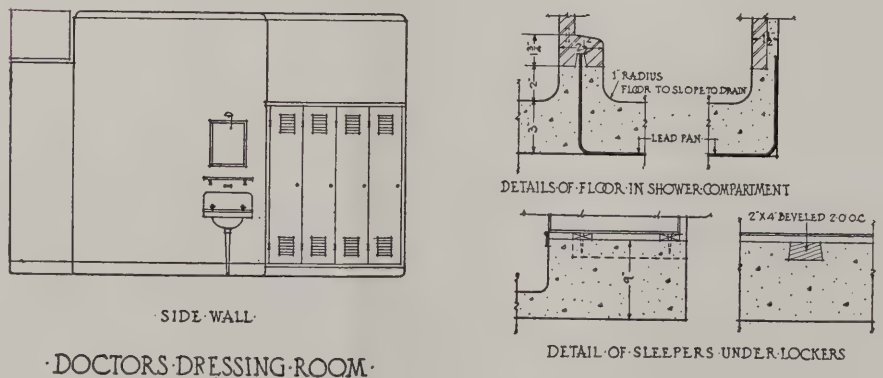
Fig. 10. Elevations of a Typical Nurses' Work Room



· DELIVERY · ROOM ·

Fig. 11





· DOCTORS DRESSING ROOM ·

Fig. 12

AN OUTLINE OF CONSIDERATIONS ON HOSPITAL PLANNING

BY

ISADOR ROSENFIELD

OF KOHN, BUTLER, STEIN AND ASSOCIATED ARCHITECTS

IT is generally conceded that hospital planning is more complex and technical than that of any other type of building. The units comprising a hospital are small, and their use and equipment are so diversified that it is exceedingly difficult to coördinate them into workable unity.

Before an architect begins to plan a hospital, he must be fortunate in either of these ways: he must have a client who thoroughly understands the problem in all its ramifications; or else he must himself have a complete grasp of hospital procedure. Seldom is the owner or the architect equipped with the necessary knowledge to properly determine the requirements and to coördinate them into a complete whole. For that reason, owners employ consultants, or the architect himself often engages the consultant. Whoever is charged with the function of determining the requirements, experience shows that unless many questions are asked, some plan features may never be brought out, and thus be inadvertently omitted. The accompanying outline is intended to serve as a guiding list of hospital considerations in the hope that it may bring out items that might otherwise be forgotten, and that it may provide useful data and information in regard to many details. It is not intended to cover every conceivable requirement or variation of requirement. The writer is well aware of the many points that could be included to amplify the present outline. In order to cover this subject in greater detail, more space would be required than is possible here.

Type of Ownership. (a) Governmental; 1. City. 2. State. 3. County. 4. Federal. (b) Civic; 1. Independent Association. 2. Industrial. 3. Fraternal. 4. Denominational. 5. Individual or Partnership.

Kind of Hospital. (a) General; 1. Teaching. (b) Special;

Children.	Convalescent.
Maternity.	Chronic.
Communicable Disease.	Cancer.
Surgical.	Eye, Ear, Nose, Throat.
Psychiatric.	Cardiac.
Tuberculosis.	Preventorium.

Size, Number of Beds Required. 1. Medical and surgical beds,—one for each 200 of population. Proportion between the two will vary to some extent with the degree of industrialization of a given community. 2. Maternity,—one for every *primipara.* Add one bassinet for every maternity bed. 3. Tuberculosis,—one for every annual death. 4. Communicable diseases,—one for each 2,000 of population. 5. Convalescents,—12 to 15 per cent of total number of beds, as determined here.

Another and cruder method of arriving at the number of beds required is based on these figures:

(a) Number of sick people in average community equals 2 per cent of population.

(b) Number of sick requiring hospital care equals 20 per cent of all sick.

(c) Add 20 per cent for vacant beds. It is necessary to provide vacant beds for "peak loads" and for epidemic or catastrophic situations.

(d) Add 12 to 15 per cent to these figures for convalescents.

Note: The methods described here do not take into consideration local conditions which may alter the proportions to a greater or lesser extent.

Estimate of Cost. 1. Cost per bed depends on type of patient accommodations and the extent of treatment facilities.

2. Cost per cubic foot depends on nature of construction, sizes of units, extent of equipment requiring connections, locations, etc.

3. Probably the best way to estimate the cost is to prepare preliminary plans and specifications and to obtain an estimate from a contractor experienced in the type of hospital building contemplated.

4. These references to cost per bed do not include cost of housing the personnel.

In the average good hospital there is one nurse for every two patients. This is for a two-shift day. More nurses are required for a three-shift day. The non-professional staff and servants form a group about as large as the nursing staff. Therefore, unless a part of the staff or servants is to live outside, it is necessary to provide housing and recreational facilities for a number of persons approximately equal to the number of patients' beds.

Selection of Site. General Location,—country, suburb or city. Accessibility,—for patients, personnel, supplies, visitors. Extent of Site,—cost, type of buildings, (i. e. cottage, pavilion or multi-story); possibilities for future extension. Latitude and orientation to sunlight. Shape and topography of terrain. Non-proximity to disagreeable surroundings. Availability of water, sewage disposal, gas and electricity.

Type of Buildings—

Cottage Plan. Pavilion Type. Multi-story Buildings. Combination of These Types.

Type of Construction.

Fireproof. Semi-fireproof. Frame Construction.

It is generally conceded that patients should not be housed in any but fireproof buildings, even if the buildings are only one story high.

Criteria of Sound Hospital Plan. (a) Utility. (b) Diversity. (c) Facility of Operation. (d) Flexibility. (e) Health. (f) Economy. (See article on "Introduction to Hospital Planning," by Dr. S. S. Goldwater, Modern Hospital Year Book, 1926.)

Departments and Services in a General Hospital:

Medical	Genito-urinary.
Surgical.	Nutrition.
Obstetrics and Gynecology.	Orthopædics.
	Contagious.
Pediatrics.	Tuberculosis.
X-ray and Radium.	Social Service.
Laboratory and Pathology.	Pharmacy.
	Dental.
Physio-therapy.	Medical Records.
Dermatology.	Medical Staff.
Neurology, Psychiatry.	Nursing Staff.
Eye, Ear, Nose and Throat.	Male and Female Servants.

Accommodations and Provisions Will Be Needed Also for:

Administration.	Autopsy and Morgue.
Patients and Out Patients.	Preparation of Food.
	Laundry.
Services.	Storage Facilities.
Operating.	Heating Plant.
Delivery.	School of Nursing.
X-ray.	Housing of Nurses.
Physio-therapy.	Housing of Staff.
Laboratories and Drug Room.	Housing of Servants.

Details To Be Considered

Administration. (a) Lobby,—information desk . . ., public toilets . . ., public telephones . . ., conference rooms . . . (b) Business Offices,—general and private . . ., board room with or without serving pantry . . . (c) Professional Offices,—medical director . . ., record room . . ., superintendent of nurses . . ., admitting room and bath . . . (d) Social Service, staff room . . ., consultation rooms . . ., library . . ., staff toilets . . ., ambulance entrance . . ., emergency room . . .

Patients' Quarters. Wards,—for men, women, children, maternity, new-born infants. Separating or quiet room, one for each ten ward patients. Cubic feet of space required per patient in the ward; for adults, 800 to 1,000 cubic feet,—for children, 500 to 800 cubic feet,—for infants, 200 to 300. Proportion of window area to floor area, 1/5 minimum. Separation of patients within ward: (a) By portable screens. . . . (b) By fitted or fixed screens. . . . 1. "Riggs" or "Spanish" method? . . . 2. Cubicle method, with or without curtains? (c) With curtains on curtain rods or wires? 3 Semi-private rooms, 2 to 4 patients.

Private Rooms. Minimum size, 8 feet, 6 inches x 12 feet. Standard size, 9 feet x 14 feet. With lavatory in each room? With private toilet? With private bath? With space for a cot for special nurse or patient? Rooms en suite for "group nursing"?

Children's Ward. Partition between ward and corridor should contain as much glass area as possible. Children's beds, separated by glazed screens? . . . Rooms specially decorated? . . . Closets, wardrobes, or lockers? . . . Size? . . .

Extra-ward Facilities. 1. Individual balconies or porches? . . . 2. Common balconies or porches? . . . 3. Solaria? . . . 4. Sitting rooms in the case of use by chronics and convalescents? . . . 5. Open decks? . . . 6. Glazed or open porches? . . . 7. Visitors' rooms? . . .

Services

1. Corridors,—minimum width for children's wards, 7 feet; minimum width for adults' wards, 8 feet. Corridors may be narrower if they have frequent broad spaces sufficiently wide to permit turning around of beds. Corridors should not be monotonously long. Bends in corridors serve to reduce noise. Natural light and ventilation of corridors are important. Grouping certain services about a common vestibule opening from corridor reduces traffic and noise.

2. *Stairs.* There should be at least two sets of stairs as far removed from each other as possible. Consult local laws governing stairs in hospitals. Naturally lighted stairs are preferred. Minimum width of run, 3 feet, 8 inches, no winders; avoid long runs. Stairs forming organic parts of buildings are preferred to fire escapes. Wall rails are as important as well railings. Risers should not exceed 7½ inches; tread minimum, 10 inches. In children's hospitals. 6- or 6½-inch risers are preferred. Thickness of masonry required for enclosing stairs? . . . Fireproof, self-closing doors? . . . Extent of wire glass in doors permitted? . . .

3. *Elevators* are desirable even in two-story buildings. Push-button control *vs.* hand-operation . . .; economy *vs.* safety? One elevator for all purposes? . . . Separate elevator for service? . . . Elevator for service? . . . another for patients . . ., still another for public? . . . Consider grouping elevators for economic advantages. Safety devices? . . . Emergency stop button and emergency bell? . . . Thickness of walls required for enclosing shaft? . . . Fireproof doors,—swinging, self-closing, folding, or disappearing two- or three-speed doors? Maximum area of wire glass allowed? . . . Standard finished dimensions of shaft large enough to accommodate a bed are 6 feet, 6 inches x 8 feet, 6 inches. Reduced and even speed of elevators for patients. . . . Micro-leveling device? . . . Overhead *vs.* basement location of elevator machinery? . . .

4. *Baths and Toilets.* Modern practice requires a lavatory in every patient's room or ward. Such provision is regarded as necessary to carry out aseptic technique rather than for patient's comfort. If bath or toilet immediately adjoins the room or ward, the lavatory may be placed in bath or toilet. This is less costly and perhaps better for the appearance of ward or room, but it is false economy because the lavatory should be within sight and easy reach of doctors and nurses. Except in case of private baths, the toilet should be in a separate compartment from bath. In case of congregate baths, bathing facilities should be in separate room, but there should be intercommunication between baths and toilets. In small compartments, doors should swing *out,* for if otherwise it would be hard to help a patient fainting in compartment. Private toilet, with or without goose neck for bed pan washing? . . .

5. *Utility Room.* There should be at least one major utility room for each "nursing unit," centrally located, with sub-utility rooms at frequent intervals to save steps, particularly for bed pan technique. A good size for utility room is 9 feet x 14 feet. Utility room should contain:—

Bed pan washer, or hopper, or washer and sterilizer combined? Built-in or free-standing? . . .

Utensil sterilizer, steam, gas or electricity?
Instrument sterilizer, steam, gas or electricity.
Hot closet.
Hot plate, operated by gas or electricity.
Ice box (cracked ice).
Sink, drainboard, wash tray.
Table.
Bunsen burner outlet; electric utility outlet?
Shelf for solutions . . .; in hot closet?
Space for soiled linen receptacle.
Bed pan rack . . ., heated?

Sub-utility room should contain fixtures necessary for bed pan technique. Doors to utility and sub-utility rooms to be double-acting with sight windows.

6. *Serving Pantry.* "Bacon Plan" hospitals have no serving pantries, but frequent, special lifts for food trays . . . "Bulk Service" requires steam table or electric steam table . . . "Tray Service" does not require space for steam table . . . If light cooking is required, provide hot plate,—gas or electricity . . . If dishes are washed in serving pantry, is a dish washer wanted or a sink? . . . Steam or hot water? . . . If sterilization of dishes is required, steam is necessary (in contagious wards) . . . Kitchen dresser,—open shelves, or glazed front? . . . Wood or metal? . . . Sink,—single or double drain boards? . . . Refrigeration,—ice or mechanical? . . . Local unit . . . or central plant? . . . Towel closet heated by steam or by gas? . . . Doors, double-acting with sight windows . . . Food delivered by dumbwaiter or elevator? . . .

7. *Surgical Dressings.* Special room . . . or portable wagon? . . . In alcove off corridor . . . or in utility room? . . . If in separate room, provide surgeons' sink, instrument sterilizer, instrument case, portable wagon for bedside dressing.

8. *Clothes Chute.* Metal . . . metal, glazed . . ., vitreous tile? . . . Opening from utility rooms,—corridor . . ., special closet . . ., or slop sink closet? . . . Doors kept locked? . . .

9. *Incinerator Chute.* Desirable from delivery rooms, serving rooms, etc.

10. *Linen Room and Supply Closets.* Metal . . . or wood shelves? . . . Counter shelf 2 feet wide, 3 feet high . . . Shelf under counter 16 inches wide . . . Four shelves over counter 16 inches wide . . . Shelves solid . . . or slatted for ventilation? . . . If solid, they should be supported on metal knees 1 inch out from wall . . .

11. *Nurses' Station,* to command view of elevators and corridors. Rail enclosure . . . or alcove . . . or separate room? Medicine closet . . . or built-in cabinet? . . . Running water in closet . . . or outside lavatory? . . . All medicaments in one closet . . . or separate closet for narcotics and poisons? Special measures to safeguard narcotics . . . Space for desk . . . If nurses' toilet is wanted, the best location is adjoinng nurses' station. Sitting room for special nurses? . . .

12. *Slop Sink Closet.* One . . . or more to a floor? . . . Minimum door width 2 feet. Depth sufficient to take a 2 x 2-foot slop hopper . . ., work space in front for orderly or house maid . . . Hopper with . . . or without back? . . . The nozzle should be braced and have a pail hook . . . There should be at least two shelves over hopper . . . A row of hooks for brooms, mops, etc. . . .

13. *Flower Room.* Separate room or in connection with bath? Sink . . ., drainboard . . ., cabinets or shelves for vases . . ., etc.

14. *Stretcher and Wheel Chair Space.* In corridor . . ., in wards . . ., or in separate alcove off corridor? . . .

Operating Department

In a wing of first floor . . . or top story? . . . If in first story, this department should adjoin ambulance entrance . . . Number of major . . . and minor operating rooms?

. . . "Operating amphitheater"? . . . Other rooms in this department are:—Sterilizing room . . ., Nurses' workroom . . ., Anæsthetizing room . . ., Scrub-up space . . ., Recovery rooms . . ., Surgeons' dressing room . . ., Laboratory . . ., Observation facilties . . ., Orderlies' room . . ., Nurses' toilet . . .

1 *Major operating rooms* may be about 18 x 24 feet; minor operating rooms about 14 x 16 feet. Ceiling height should be about 12 feet. Orientation to north desirable. Surgeons' sink and instrument sterilizer in each room? . . . Instrument cabinet in room . . . or outside? . . . Built-in . . . or free-standing? . . . Floor drain? . . . Ejector operated by running water? . . . Skylight lighting . . . *vs.* window light . . . Wall finish,—marble . . ., tile . . ., cement plaster . . . or . . .? Floor finish,—tile . . ., terrazzo . . ., treated cement . . . or . . .? Brass strips in floor grounded to pipe to prevent explosions of anæsthetics, due to static electricity . . . Means of darkening eye-operating room . . .

2. *Sterilizing Room.* Located between two major operating rooms . . . or en suite with workroom? . . . Water still . . ., dressings sterilizers . . ., utensil sterilizers . . ., instrument sterilizers . . ., sink and drain board . . . If distilled water piping system is desired, still may be best located in pent house . . .

3. *Nurses' Work Room.* Long table, cabinets and cupboards . . . Blanket warmers? . . .

4. *Anæsthetizing Room.* Finished like typical patient's room . . . Not within sight of operating rooms, if possible . . . No fixed equipment required.

5. *Surgeons' Scrub-up.* In operating department corridor . . . or in alcove within sight of operating rooms? . . . Scrub-up sinks,—knee control . . ., elbow control . . ., or foot pedal control? . . .

6. *Recovery Rooms.* Required if operating service is in connection with large wards . . .

7. *Surgeons' Dressing Room.* Lockers . . ., lavatory . . ., toilet . . ., shower . . .

8. *Laboratory.* Desirable when main laboratory is not close to operating department . . .

9. *Observation Facilities.* Amphitheater? . . ., gallery between each pair of operating rooms . . ., stand in each operating room? . . .

Delivery Department

(a) Labor room or rooms? . . . Lavatory in each . . .

(b) Delivery room or rooms? . . . Equipped much like a minor operating room . . . North light preferred . . .

(c) Sterilizing room like that in operating department, often combined with functions of nurses' work room of operating department . . .

(d) Surgeons' dressing room should, in addition to items already enumerated, have space for a cot . . .

Laboratories

Laboratories and Drug Room or Pharmacy. Good natural light a factor; north light preferred. Location between in-patient and out-patient departments preferred. Small laboratory, all functions in one room . . . Sometimes combined en suite with pharmacy . . . Large laboratories subdivided into branches, as—Routine . . ., Chemistry . . ., Bacteriology . . ., etc.

Essential Features of Laboratories. Counter tops of stone . . . or wood? . . . Cupboards . . ., cases and shelves . . ., for chemicals . . ., instruments . . ., reagents . . ., etc. Sinks for washing . . ., and preparation of stains . . . Gas outlets for Bunsen burners . . . and autoclaves . . . Electric outlets for centrifuge . . ., incubators . . ., etc. Refrigeration,—ice . . . or mechanical? . . . Metabolism laboratory?

X-Ray Department

The location should be dry and accessible to both in- and out-patients. A *small department* should have (a) combination fluoroscopy . . ., radiography . . . and treatment room . . . (b) Office and interpretation room . . . (c) Developing room . . . (d) Waiting space . . . *Large Department.* (a) One . . . or more radiography rooms . . . (b) One . . . or more fluoroscopy rooms . . . (c) Deep therapy room . . . with machine in separate and extra-insulated room . . . (d) Light treatment room . . . or rooms . . . (e) Viewing room . . . (f) Office . . . (g) Developing room . . . (h) Waiting space . . . (i) Dressing rooms . . . (j) Plate storage room . . . (k) Toilet in connection with gastro-intestinal work . . .

Ceilings. Ceiling height not less than 10 feet in clear of all beams, pipes, etc.

Insulation. Floors . . . ., doors . . . and partitions to height of 7 feet (but not exterior walls) insulated with lead? . . . With barrium plaster? . . . Thickness of insulation? . . . Method of fastening lead to partition? . . .

Color of fluoroscopy room walls and ceilings? . . . Color of walls and ceiling in developing room?

Prevention of shock to operator by use of rubber mats? . . . Conducting away of static electricity by use of terrazzo floors with brass strips grounded to water pipe . . .

Dark Room Entrance by maze . . . special revolving door . . ., or specially rabbeted door? . . . Manner of introducing fresh air without admitting light . . ., and of conducting away of foul air? . . .

Electric Current. Characteristics of? . . . Independent line from transformer? . . .

Physio Therapy

Facilities in each organized section; office . . ., dressing cubicles . . ., treatment cubicles . . ., or common room? . . . Rest room with . . . or without cubicles? . . . Toilets . . .

1. *Hydrotherapy and massage* may require any of these details; needle bath . . ., douche . . ., sitz bath . . ., mud baths . . ., continuous baths . . ., electric water baths . . ., salt . . ., sand . . ., carbondioxide . . ., or sulphur baths . . ., massage . . ., hot and cold packs . . ., corrective gymnastics . . ., swimming pool . . .

2. *Artificial Heliotherapy.* Bedside treatment . . . or separate department? . . . Individual lamps? . . . Congregate arc lamps? . . .

3. *Natural Heliotherapy.* Usually combined in one department with artificial heliotherapy. Direct sun treatment . . ., shade treatment . . ., protection from view . . ., protection from wind . . ., treatment under glass which transmits the ultra-violet ray . . ., kind of glass? . . .

4. *Occupational Therapy.* Bedside work? . . . Special shops? . . . Storage of materials . . ., instruments . . ., and appliances . . .

Other Provisions

Autopsy and Morgue. Location in basement . . ., near elevators . . ., exit not visible to patients . . . Autopsy room equipped with autopsy sink . . ., table . . ., cabinet . . ., floor drain . . . Morgue separate . . . or combined with autopsy room? . . . Morgue equipped with table . . ., sink . . ., floor drain . . ., body refrigerator . . . Mechanical refrigeration? . . . Number of boxes? . . .

Out Patient Department. In same building with hospital . . . or separate building? . . . If in separate building, how connected to main hospital? . . . Covered passage . . . or tunnel? . . . To what extent will diagnostic and treatment facilities of main hospital be available for out-patient department? . . . Arrangement of diagnostic and treatment facilities should be such as to be available without duplication for both hospital and out-patient department. If in same building with main hospital, provide separate entrance . . ., waiting room . . ., information office . . ., cashier's office . . ., toilets . . ., detention rooms for patients with symptoms of contagious diseases . . . dressing rooms, lockers, and toilets for out-patient staff. Diagnostic and treatment facilities are not re-enumerated, as it is assumed that either the hospital facilities will be utilized or that a separate set of facilities will be provided . . . For possible clinics see list of "Services and Departments," page 909. Ascertain schedule of clinics and what rooms, if any, could be used for more than one clinic at different times.

Typical examination room should have: Examining table . . ., desk . . ., lavatory . . ., cabinet for supplies . . ., one or more dressing cubicles . . .

Special Rooms. 1. *Surgical dressing room* shall have: Simple operating table . . ., sterilizers . . ., surgeons' sink . . ., supply cabinet . . ., instrument cabinet . . . 2. *Dental room,*—one or more chairs with the other usual equipment . . . Small work room . . . 3. *Eye room* large enough to have a 21-foot range at least in one direction . . . Windows arranged for complete darkening . . . Sink . . ., sterilizer . . ., cabinet . . . Dark room . . . 4. *Ear, nose and throat room,*—examination cubicles . . . Sink . . ., sterilizer . . ., cabinet . . . Small dark room . . .

Housing of Personnel

1. *The Superintendent.* (a) Separate dwelling . . . location . . ., capacity . . ., private garage? . . . (b) In wing

of staff house . . . separate entrance . . ., number and disposition of rooms . . ., relation to staff house? . . .

2. *Internes and House Staff.* (a) In separate building? . . . relation to other buildings . . . Provision for members with families? . . . Common sitting room . . ., library . . ., reception rooms? Single rooms . . . or suites? . . . With study? . . . Congregate . . . or individual baths? . . . Dining room . . . and pantry? . . . (b) In hospital building? . . . Location adjoining operating . . . or delivery department? . . . Single rooms . . . or two in a room? . . . Running water in each room? . . . Common bath? Tub or shower? . . . Sitting room? . . .

3. *Nurses.* In separate building preferred . . . Location, . . . relation to hospital buildings . . . Connection to hospital by covered passage? . . . (a) *Undergraduate Nurses,*—One . . . or two in a room? . . . Running water in each room? . . . Wardrobes or closets? . . . Mirror on closet door? . . . Baths . . . and toilets . . . in separate rooms, but connected by door . . . Showers? . . . One tub or shower for each 5 or 6 nurses, one water closet for 5 or 6 nurses. 1 lavatory for each 4 nurses. Kitchenette on each floor? . . . Sitting room . . . adjoining kitchenette? . . . Sewing room? . . . Linen room . . . or closet on each floor . . . Slop sink closet on each floor . . . (b) *Supervisors,* instructors and other assistants of professional grade. Two bedrooms en suite with common bath . . . Common sitting room for this grade? . . . Distribution of suites in building for effective supervision . . . (c) *Superintendent of Nurses.* Living room . . ., bedroom . . ., bath . . ., private porch? . . . (d) *General Features.* Common living room with kitchenette . . . Reception rooms . . . Public toilets . . . Gymnasium with swimming pool? . . . Showers, . . . common locker room . . . or individual dressing rooms? . . . Sleeping porches? . . . (e) *Administrative Features.* Lobby with entrance from street . . . Separate exit to permit going to hospital . . . without passing through lobby. Matron's office . . . Post Office, in-and-out board . . . (f) *Training School.* In separate building . . . or in nurses' residence? . . . Relation to nurses' residence . . . Auditorium or assembly hall . . . Large lecture room . . . Small lecture rooms . . . or classrooms . . . Demonstration room with these features in alcoves or separate rooms: 1. Bed care demonstration. 2. Utility demonstration. 3. Serving kitchen demonstration. Laboratories,—chemistry,—biology,—bacteriology,—dietetics . . . Massage room? . . . Library? . . . Study rooms? . . . Offices for instructors? . . . Storerooms and closets for equipment and materials? . . . (g) *Separate kitchen and dining room* . . . or in connection with hospital plant? . . . (h) *Infirmary for Sick Nurses.* Location? . . . Typical nursing unit? . . . Single rooms for those seriously ill? . . . Wards for convalescents? . . . Examination room for school physician? . . . (i) *Provisions in Basement.* Trunk room . . . Nurses' personal laundry? . . . "Beauty shop"? . . . General stores? . . .

4. Housing personnel of non-professional grade. Location? Over garage . . . or service building . . . or in separate building? . . . Relation to other hospital buildings? . . . Division between male and female servants? Horizontal or vertical? . . . Provisions for flexibility? . . . One or more in a room? . . . Congregate baths and toilets . . . (See nurses' baths for schedule of fixtures.) Common sitting room, . . . kitchenette? . . . Post Office . . . and package room? . . . Personal laundry? . . .

Kitchen and Services

Kitchen. Type of service required? . . . Location in upper . . . or lower story? . . . Food storage rooms, . . . refrigeration . . . Mechanical refrigeration . . . or ice? . . .

(a) *Main Kitchen.* 1. Preparation space,—vegetable preparation, sinks . . ., parer . . ., tables . . ., meat preparation, block . . ., sink, . . . grinder, . . . table . . .; fish . . . ice cream machine, salt box . . ., table . . . 2. Daily supplies and refrigeration. 3. Ranges, . . . broilers, . . . bake ovens . . ., soup kettles . . ., vegetable steamers . . ., hood . . . hood lights, . . . hood steam jet for fire extinguishing . . . 4. Cook's table, . . . *bainmarie,*—plate warmer, . . . steam . . ., egg cooker . . ., toaster . . ., sink. 5. Salad table . . ., bread slicer . . ., coffee, milk, cream and hot water urns . . . 6. Pot sinks . . ., table . . ., mixer. 7. Dish washing,—soiled dish table . . ., garbage pails . . ., silver sinks . . ., dish washer . . ., clean dish table . . ., shelving for dishes, etc. 8. Serving table . . ., tray trucks . . ., tray setups . . . 9. Cold water. . . . 10. Space for food carts.

(b) *Diet Kitchen.* 1. Ranges . . . 2. Refrigeration . . . 3. Sinks . . . 4. Tables.

(c) *Dietitian's Office,* commanding view of kitchen. Equipment,—desk . . ., files . . ., telephone . . .

(d) *Dining Rooms.* 1. For nurses . . . one or more sittings? . . . Cafeteria . . ., or waiter service . . .; or convertible for either? . . . 2. For staff . . . waiter service? . . . 3. For male and female servants . . . in one or in separate room? . . . Cafeteria service? . . . 4. Separate dining room for superintendent and distinguished visitors? . . . 5. Dining room for out-patients and visitors?

Store Rooms. Storekeeper's office . . ., receiving room . . ., receiving entrance.

Food storage,—groceries . . ., staple vegetables . . ., meat . . ., perishable vegetables . . ., fruit . . ., dairy products . . ., eggs.

Furniture storeroom . . ., and carpenter shop.
Bedding storage . . . and fumigation room.
Patients' clothing.
Soiled linen room.
Dead records room.
Drug room.
General supplies.
Ice-making machine . . ., ice tank . . . and ice storage bin.
Storage for screens . . ., ladders . . ., hose . . ., shovels . . ., etc.

Miscellaneous Facilities (usually provided in basement). 1. Locker room . . . with toilet and shower facilities for special nurses. 2. Locker room . . . with toilet and shower facilities . . . for servants; separate facilities for male . . . and female help. 3. Housekeeper's office. 4. Machinery room or rooms.

Laundry. Location where noise of machinery will not disturb patients. or interfere with diagnostic procedure. *Elements,*—receiving and sorting space . . ., washing . . ., drying . . ., and ironing space . . ., clean linen room . . ., sewing room . . ., supply room or closet . . ., servants' toilet. *General Considerations,*—One-story . . ., *vs.* two-story plan . . ., rotation of working process . . ., light and ventilation . . ., nature of motors . . ., characteristics of available current . . ., type of machine control,—i.e., single panel with individual motors . . ., or single motor with continuous shaft? . . . Available steam pressure? . . . water pressure? . . . *Machinery and Equipment,*—Mattress disinfector? . . . Sterilizing washers? . . . Wood washers . . ., copper washers . . ., or monel metal washers? . . . Sorting trucks . . ., Soaking tubs . . ., Water softeners? . . ., Soap tanks . . ., Starch cookers . . ., Extractors . . ., Drying tumblers . . ., Drying racks . . ., Flatwork ironers . . ., prim presses . . ., hand ironers . . ., Sewing machines . . ., foot . . ., or electrically operated? . . . Tables . . ., shelving for handling and storing clean linen.

HOSPITAL BUILDING COSTS

BY

CARL A. ERIKSON

OF SCHMIDT, GARDEN & ERIKSON, ARCHITECTS

THE only proper introduction to this subject would be a thousand or more pages discussing and illustrating hospital planning and detail. As that privilege would, no doubt, be denied me, I must content myself by saying that hospital costs are pretty largely determined by the ideals, purposes, and purse of the sponsors. It is hard on me to be denied the privilege of explaining why, but easier on anyone who chances to read this article. It is difficult to convey information of this kind in such a way that it will not be misunderstood or misinterpreted; just the necessary definitions would probably exhaust the entire space assigned to me. It would be easy to becloud this subject with vaporings as useless as spent steam on a frosty morning. But I know that architects would like information that they can "put their teeth into."

I propose to discuss the questions in regard to costs in the order in which they usually come up in our practice. The first question is always "What does a hospital cost per bed?" Similar questions are constantly being asked about the cost per seat of schools, theaters, and churches, and of the cost per room of apartments, hotels, etc. It does no good to tell your client that such figures are valueless,—he still wants to know the answer. The architect experienced in any one of these classes of buildings can extract enough information from the client in a few moments to give a figure that is within 25 per cent of the correct amount by comparison with the costs per room, per seat, or per bed of buildings similar to that described by the client. Every architect, no doubt, qualifies such answers in every possible way. "What does a hospital cost per bed?" raises three additional questions at once: (1) What kind of a hospital? (2) What is to be included in costs? (3) What is a bed? There are as many different kinds of hospitals as there are of women's hats. A teaching hospital in a large city is far more expensive than a hospital serving a small town and its environs. A hospital consisting of large wards is far less expensive than one consisting of rooms for private patients. One with a large out-patient department will obviously cost more per bed than one without an out-patient department.

For the purposes of this article, I have included in the costs everything that is permanently attached to the building except sterilizers and laundry and kitchen equipment. The costs do not include any planting, roads or landscaping, nor do they include the architect's fee. The costs of laundry, sterilizers and kitchen equipment will be from 3 to 6 per cent of the other building costs. Loose equipment, including X-ray, laboratory, linens, etc., will add from 10 to 18 per cent to the basic building costs.

In all costs and calculations we give here, we do not include the costs of nurses' homes or of servants' quarters. Such buildings vary greatly in size in proportion to the bed capacity of the hospital. In many cases, no servants' quarters are included. In others, only a very few servants are housed, while an occasional hospital makes ample provision for them. Such housing must be estimated separately. The number of nurses to be housed also varies greatly,—as well as the method of housing. In an occasional hospital, the number of nurses may be as high as one nurse to a patient, and then descends the scale to some county institutions with one nurse to six or ten patients. A nurses' home of an approved type will contain from 2,800 cubic feet per nurse to 6,000 cubic feet. If of fireproof construction, the cost of the building would be somewhere between 35 and 90 cents per cubic foot, depending on location, height, finish, detail, etc.

A bed, as we count it, is any bed *normally* in place except those bassinets in the nurseries of the maternity department. We have found that the space occupied by resident personnel, such as internes, nurses, executive staff or sisters, within the hospital, could in most cases be occupied by an equal number of patients. As the number of such residents varies greatly, we find that the most accurate of these very crude cost-measuring devices is the cost of *all* beds (except nursery).

The costs per bed for ten hospitals (including power house and laundry but not nurses' or servants' quarters) designed during the last five years were:

Hospital	*Per Bed*	*Per Patient*
No. 1	$5,447	$6,370
" 2	3,290	3,430
" 3	9,750	10,450
" 4	5,750	6,025
" 5	5,380	7,040
" 6	4,700	5,100
" 7	3,814	4,525
" 8	2,902	4,191
" 9	7,268	7,822
" 10	5,820	6,040

If the nursery beds were added in the bed count, the costs would be reduced by from zero in one case to 25 and 30 per cent in others. If the potential or emergency capacity is figured, the costs per patient's bed would shrink another 25 per cent in some cases. Many figures lower than any of those given here are frequently quoted. Before worrying very much about them, the architect should first find out how the beds are counted, what kind of a hospital it is, and what the costs include. We have made similar inquiries so many times that we place little credence in low costs per bed. During the

past five years, we have built a structure (called a "hospital" by its owners) for less than $2,000 per patient's bed. It is not an acute disease general hospital, and so it is not included. During the same time, we have built private-patient additions to hospitals that would have cost between $15,000 and $18,000 per bed had they included all of the necessary dependencies within the additions. What little dependence the architect or his client can place on "cost per bed" is evident.

The logical approach to any building project is in the setting down of the things that should go into the building,—in other words, the preparation of a program. Sometimes this comes to the architect rather fully developed by a consultant. More frequently, he must prepare it himself with such information as he can obtain from his clients and their advisers. Sketch plans should then be developed, and they will indicate the size or cubic contents of the building. As a guide, I have selected ten from among our recent hospitals and give the number of cubic feet per bed, and per patient:

Hospital	*Per Patient's Bed*	*Per Bed*
No. 1	10.250 cu. ft.	8,746 cu. ft.
" 2	6,250 " "	5,800 " "
" 3	11,540 " "	10,800 " "
" 4	9,350 " "	8,940 " "
" 5	13,400 " "	10,250 " "
" 6	8,540 " "	7,860 " "
" 7	7,600 " "	6,410 " "
" 8	10,440 " "	7,220 " "
" 9	8,000 " "	7,660 " "
" 10	7,840 " "	7,560 " "

It might be well to add here that our definition of the cubage is identical with that of the A.I.A. as given in Document 234,—"the actual cubic space enclosed within the outer surfaces of the outside or enclosing walls and contained between the outer surface of the roof and the finished surfaces of the lowest floor." Is it possible to draw any general conclusion from the contents per bed or per patient's bed? The average would be of no value. About all that can be said is that a hospital of less than 7,000 cubic feet per patient is very tightly planned, with a minimum of space assigned to the auxiliaries.

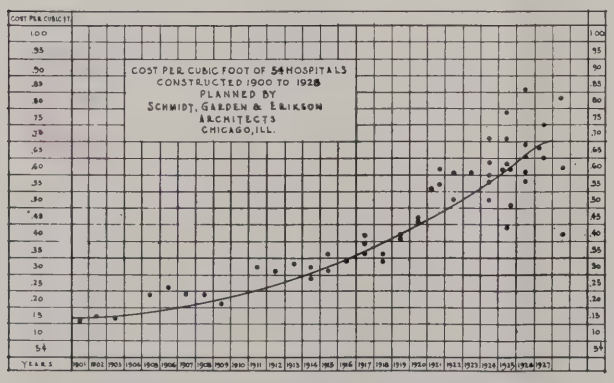


Chart 1. Cost of 54 Hospitals, per Cubic Foot, 1900 to 1928

The costs of any building might be expressed algebraically thus:

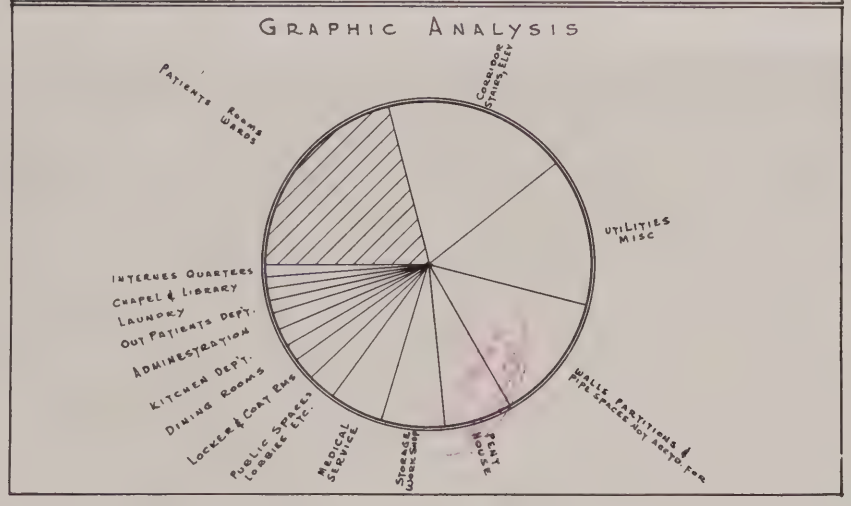
(a, b, x = y):
if a = the volume,
b = the materials and method of installation,
x = cost of construction and installation,
y = total cost.

The volume of the building has been roughly determined by the preliminary sketches. The architect will, no doubt, have a general idea of the client's wishes in the matters of detail and finish. It is not necessary to remind architects of how vitally their decisions in such matters will affect the cost of any building. Nor is it necessary to remind the architect of the importance of considering such matters as the location, kind of foundations, etc., in estimating the costs per cubic foot.

In the equation a, b, x = y, the contractor expresses the volume by accurate quantities of brick, pipe, etc., and x by the quoted prices of materials and estimated cost of labor required to install them, to which is added a profit (maybe). But the contractor will have before him voluminous drawings and specifications accurately describing the work to be done. The architect has before him four or five sheets of small-scale sketches. He expressed b, x, by costs per cubic foot. But the cost per cubic foot is very illusive. First, it is affected by the location of the project. Building costs are higher in New York and Pittsburgh than in Philadelphia, higher in Chicago than in Detroit, and higher in Detroit than in Battle Creek, Mich., and they fluctuate from time to time (with any appreciable change in the rates of labor or costs of material). An explanation of why this is so needs the combined efforts of an economist, a contractor, a psychologist, and finally a psychiatrist. But the cost per cubic foot is also importantly affected by the planning of the building. The "plump" building costs less per cubic foot than the "lean" structure. That is a matter of arithmetic. A building with high stories costs less than one with low stories,—again a matter of arithmetic. One with large, unfinished basements and attics costs less than one with none,—this time a matter of common sense. A "tightly" planned building (i.e., with small rooms and intensive use of all spaces) costs more per cubic foot than one liberally planned. One of the lowest cubic costs of our recent hospitals was not only in an unusually low-building-cost area, but was also very liberally planned as the 10,250 cubic feet per bed show. This high content per bed was not due to extraordinary liberality of the services, but due to such things as 10-foot corridors and private rooms averaging about 10 feet x 17 feet. Of course, the greater number of stories, the greater the cost per cubic foot.

When dealing with such an extraordinarily complicated building as the hospital, it is difficult to draw conclusions from the costs per cubic foot. In order to do so, it is necessary to know the buildings intimately. Hence, while we give here a diagrammatic

An Analysis of Space Assignment of a Mid-Western Hospital Schmidt, Garden & Erikson Architects — Nov. 1928				
177 Total Patients Beds Exclusive of Nursery 177				
		Square Feet Net Area	Square Feet per Patient	% of Gross Fl Area
Patients Rooms & Wards		28,000	158.5	20.6
Utilities & Miscellanious		19,500	110.	14 4
Medical Service				
X-Ray	1060			
Laboratories	624			
Pharmacy	468			
Autopsy	312			
Birth Dep't.	1814			
Operating Dep't.	2622			
Ambulance Entrance	984			
Occupational & Physio Theropy	347			
		8,200	46.5	6.1
Out Patients Dep't.		1,700	9.6	1.3
Lobbies, Public Space Etc		3,500	19.7	2.6
Chapel & Library		1,500	9.6	1.1
Administration		1,900	10.8	1.4
Locker & Coat Room		2,600	14.7	1.9
Internes Quarters		1,500	9.6	1.1
Kitchen Dep't.		2,400	13.5	1.8
Dining Rooms		2,400	13.6	1.8
Laundry		1,800	10.	1.3
Power House		9,600	54.2	7.1
Store Rooms & Work Shops		8,700	49.	6.4
Corridors, Stairs & Elevators		25,000	141.2	18.5
Outside Walls, Pipe Spaces & Interior Partitions	Not Accounted For Above	17,000	96.	12.6
		135,300	766.4	100. %



ANALYSIS OF HOSPITAL SPACE ASSIGNMENTS, NUMERICALLY AND GRAPHICALLY

Trades	Skeleton				Wall Bearing			
								Average
Masonry, Conc. & Tile	36.	34.6	30.0	35.8	33.9	33.3	28.2	32.8
Cut Stone & Terra Cotta	4.0	2.6	1.5	1.1	3.0	2.9	4.2	2.7
Steel - Structural	3.0	3.1	1.7	5.5	3.3	1.6	3.6	3.1
Ornamental Iron & Bronze								
Elevator Doors	1.7	1.3	3.9	.1		1.2	2.7	2.2
Hollow Metal Doors				.7	In Sheet Metal	.1		
Steel Frames						2.2		
Hollow Metal Wind.	In Sheet Metal	In Sheet Metal		In Sheet Metal				
Carpentry & Hardware	11.1	8.0	7.0	7.7	17.4	8.0	6.8	9.3
Lath & Plaster	5.0	10.0	7.5	4.8	8.5	8.0	6.6	7.5
Sound Absorbing Mat.	.2		2.1	In Plaster				
Roofing & Sheet Metal	1.3	1.6	1.7	1.5	2.0	2.4	2.1	1.8
Painting	2.5	2.4	2.0	1.7	3.5	1.5	2.5	2.4
Glazing	.9	.6	.4	.5	.8	.6	1.	.7
Marble	1.4	1.7	.5	.5			1.3	.8
Tile	1.1	.5		6.7		1.1	3.4	
Rubber Tile	1.0						.8	7.1
Terrazzo	4.1	6.8	5.9		7.8	5.9	4.8	
Metal Cases Etc.	.1		.5	1.7		.5	2.1	.8
Refrigerators	.5	1.0	.7	.6	0.5	.7	1.	.6
Screens	.7	.7	.8	.5	In Carpentry	.3	.5	.5
Weather Strips	.2	.2		.1	0.4		.2	.2
Miscellanious	.1	.2					1.	.05
Light Fixtures	.9	1.0	1.0	1.	1.2	1.5	1.2	1.1
Total Architectural	75.8	76.	68.8	72.	81.2	73.3	73.6	74.4
Plumbing	18.1	8.7	10.8	9.1	9.0	8.4	7.6	8.7
Heating		7.5	10.4	7.7	5.8	8.8	8.6	9.
Ventilating			1.6	1.6			2.	
Wiring	2.9	3.5	3.	3.4	1.7	4.8	5.9	3.6
Elevators	2.1	2.7	3.2	3.7		2.1	1.6	2.5
Dumbwaiters					1.1	.4	.3	
Refrig. Machine	1.1	1.6	2.1	1.6	1.2	2.	1.5	1.6
Incineratore	In Masonry		.5		In Masonry		.3	.4
Total Mechanical	24.2	24.	31.2	28.	18.8	26.7	26.4	25.6

Figures Given Above Are Percentages of the Total Cost. No Nurses or Helps Quarters Included.
Schmidt, Garden & Erikson Architects
November 1928

HOSPITAL COSTS ANALYZED TO SHOW PERCENTAGES BY TRADES

chart of the costs per cubic foot of hospitals, it is with a realization that they can be only a very crude guide. No additions are included,—no matter how large they may be,—for they are not comparable to the complete hospital unit.

The ascending curve of cubic-foot costs, shown on Chart 1, is explained in part by the rise in costs of building, and in part by the better buildings now commonly erected,—and also by the improvement in the quality of finish and details now considered necessary in the modern hospital. With hospitals costing so much, it is obvious that rigid economy of the use of space is necessary. An interesting study was made in our office a few years ago to determine the percentage of space utilized for various departments. The hospital was erected in the middle west a few years ago. It houses 177 patients (normally, largely in private rooms, many with private or communicating toilets). It provides for 31 babies in the nursery of the maternity department. Provision has been made in most of the departments to care for an additional 50 to 100 patients should they be needed. I cannot say that this is a typical mid-western hospital, for we have not made similar calculations for other hospitals. It is interesting to note that only 20.6 per cent of the gross area developed within the outside walls is used in the patients' rooms and wards.

Here is another interesting comparison that is passed along for whatever it may be worth. It concerns the private-room floors of six hospitals designed between the years of 1923 to 1925 and gives the area per room of these floors.

Epworth	257	sq. ft.
Christ's	259	" "
Illinois Central North	287	" "
Mt. Sinai	324	" "
St. Agnes'	386	" "
Washington	494	" "

The difference between 257 square feet and 494 square feet per room may occasion some raising of eyebrows, but it need not, for each one of these hospitals is economically planned for the purpose intended.

Another interesting comparison between the ward floor and the private-room floor of a hospital now under construction is that the ward floor has 52 beds divided into 24 beds in 4-bed wards, 20 beds in 2-bed rooms, and 8 private rooms. The private-room floor has 28 private rooms.

Ward floor	52	patients	250 sq. ft. per patient
Private rooms	28	"	465 " " " "

And yet the statement is frequently heard that private rooms cost no more than ward beds! Its absurdity is manifest.

To show where the hospital building dollar goes, we have prepared a tabulation of the percentages of costs for the various trades. We do not include in these totals the cost of laundry machinery, kitchen equipment or sterilizing equipment. The buildings vary in cost from 47 cents to 72 cents per cubic foot, and all are of fire-resisting construction with reinforced concrete floors. Four are of skeleton concrete construction; three are wall-bearing with interior columns of skeleton construction.

Many of the differences in the percentages can be readily explained, but in some cases they "surpass all understanding." I have presented the percentages of the total costs rather than of the cubic foot costs, for, as said before, Duluth costs cannot be compared with Chicago or Pittsburgh costs.

The architect with but little experience with hospitals is likely to underestimate their costs. He will make comparisons with hotels and perhaps conclude that the hospital will not cost as much. In this he will make a grievous error. A carefully detailed hospital will probably cost from 10 to 25 per cent more per cubic foot than a hotel that is in any way comparable.

As I said at the beginning, this is a hard assignment. I doubt whether I have helped anyone with his problem. The records I have given here are a faithful transcription from our own records, but they will be of little value to anyone unless they are accompanied by plans and specifications,—in other words, with that intimate knowledge of the project which comes from living with it day by day. Yet we have found our estimates of cost, based on these and many other similar projects, uncannily accurate in predicting cubic foot costs. Sometimes they are wrong,—as often our estimates are too high as they are too low. Yet the hard assignment made by the editors of THE FORUM is as nothing compared to the assignments being daily given to architects. What will this hospital cost? The architect has before him a few preliminary sketches,—a hazy idea of the client's ideas as to finish, etc., and upon this he is expected to predict within a small percentage what a building will cost from two months to a year later. When the completed working drawings and specifications are submitted to the contractors for tenders, 30 to 50 per cent variations in the figures submitted are commonplace. Yet, if an architect's estimate is that much too low, he often finds himself bitterly condemned because he hasn't the gift of prophecy! About the only thing that the architect can definitely promise a hospital client is the extent of the cubic contents after preliminary studies have been approved. He will find that this requires eternal watchfulness or he will find a foot added there, something here, etc., as the working drawings progress. He will often find that the cubic contents are like a balloon,—constantly being blown up,—and when the bids come in, the balloon bursts and the architect finds himself without a parachute. Never be without one! Notify your client daily, if necessary, of the state of inflation of the cubic contents!

THE LIGHTING OF HOSPITALS

BY
KIRK M. REID

RETROSPECTION. we may safely conclude, has always been held in somewhat ill repute. In Biblical times, Lot's wife looked back at blazing Sodom and promptly became a pillar of salt. In the middle ages an Italian gentleman by the name of Dante could imagine no worse punishment for those who dared to pose as prophets than that they be sentenced to wander through Hades with their heads reversed on their necks,—permanent retrospection, as it were. And now, in this era of rapid locomotion and building for the future, paying too much attention to the past is usually considered to be a sign of old age or lack of creative ability. Yet, in order to get a general view of the subject of hospital lighting, we ought to devote a few moments to past practice.

It quickly becomes evident that the early methods of hospital lighting will not afford the inspiration derived from a Parthenon or a Reims Cathedral. Quite the reverse. Until a very few years ago the hours for operating were confined to the period during which there was good daylight, and woe to the unfortunate patient who had to have an emergency operation at night! The light sources were feeble enough at best, and to complicate matters they had to be kept far enough away from the wound to avoid contagion from the gaseous or solid products of combustion. While the development of the incandescent lamp in 1878 made available a light source free from all emanations, these early lamps had to be located fairly close to the operating area in order to provide enough light for the surgeon, and the lighting equipment was a potent dust collector. Because of the primary importance of asepsis, all sorts of schemes were tried to eliminate the necessity of having lighting equipment suspended above the operating table. One installation, now obsolescent, consisted of a battery of lamps in reflectors mounted outside of the operating room skylight. Another plan involved the use of a number of mirrors to re-direct to the operating table beams of light projected from an arc lamp in an adjoining room. But the usual operating room light, consisted of one large incandescent lamp, or a number of small lamps, in a reflector located above the operating table and directing the light down to it.

The subject was constantly receiving attention, but constructive ideas about hospital lighting seemed to be lacking. In 1922, to cite an actual example, there was a joint meeting of the Illuminating Engineering Society of England and the Royal Society of Medicine. After listening to one of the lighting experts tell his full story of the then "modern" methods of hospital lighting, a prominent physician remarked that he had expected to be told that his present lighting practice was wrong, but he found that nothing very new had been put forward, and certainly nothing in any sense revolutionary. To one acquainted with the noteworthy developments which had, by that time, been made in other fields of illumination, this apparent lack of progress in hospital lighting is hard to explain. Judging from the account of this London meeting and from other printed matter on the subject, it seems that the year 1923 marked the real beginning of good artificial illumination in hospitals. True, there were a few commendable installations before that time, and there have been a number of mediocre installations since; but commencing in 1923 the trend has been distinctly upward. There is a better understanding of the problem, and good lighting systems have been developed.

At this point we might pause and draw two general conclusions based upon the foregoing retrospection. First, the science of hospital lighting is still in its infancy, and, as it is true in the case of any comparatively new development, architects are in an ideal position to render valuable service to hospital authorities by making a careful study of the problem before drawing up lighting specifications. Second, past practice is of little or no value as a guide; in any hospital which was built more than half a dozen years ago and has not since been re-lighted, the lighting facilities are almost certain to be obsolete. Further, the lighting of even a new hospital should not be used as a model without making sure that it really represents good practice.

Light for Operating Rooms. Few subjects are so fraught with brickbats for the hapless author as is *color quality of light* for hospital operating rooms. Widely different views exist among those who are recognized as experts in the matter of color quality. This is quite indicative that there are several more or less conflicting factors involved, and until investigations have been made to obtain more definite data, the balancing of these conflicting factors is largely a matter of opinion.

In stating the principal requirements to be met by a lighting system for an operating room, surgeons seem to agree that the operating table should be supplied with a comparatively high intensity of light, approximately white in color. There are, of course, other requirements. The light should be properly directed and sufficiently diffused to penetrate a deep incision without objectionable shadows from the surgeon's head or hands; no glaring light sources should exist within the field of view; the light should be steady and reliable; the temperature rise on the operating table should not be excessive; and the lighting equipment should not collect or disseminate dust. These latter requirements, while unquestionably important, are not quite as fundamental as the two first mentioned, and furthermore, they do

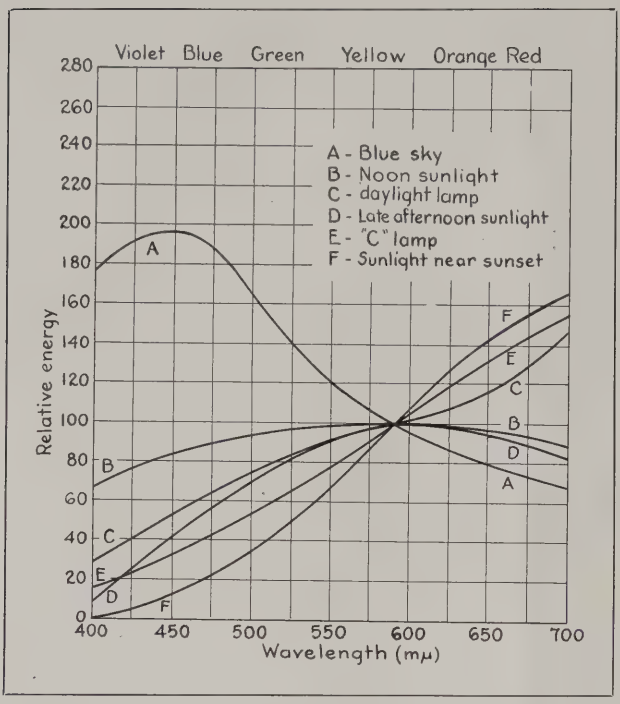


Fig. 1. Spectral Analysis of Daylight and Lamps

not offer much room for argument. In marked contrast, both intensity and color quality are largely relative and therefore controversial.

First, it is hard to put a definite foot-candle valuation on the requirement that there be a "comparatively high tensity" of light on an operating table. Not much help is obtained from a study of daylight values. It is generally known that outdoor daylight illumination, excluding direct sunlight, varies from around 100 foot-candles on a dark day to about 2000 foot-candles. Interior daylight illumination follows the outdoor variations, although the intensities are, of course, only a fraction of the outdoor values. In factories and offices, from 10 to 20 foot-candles over an entire room may be regarded as good practice for both artificial and natural illumination. In a hospital operating room having a large skylight, where translucent screens or other means are provided to exclude direct sunlight, the daylight illumination on the operating table will usually range from 50 foot-candles to about 1000. Perhaps half this much light will be obtained if the operating room has side windows instead of a skylight. Except for the general experience that the lower levels of daylight illumination fall below the desirable minimum for operating, these figures are not particularly helpful. However, they do explain, at least in part, why the intensities of artificial illumination recommended by various authorities range from around 1000 foot-candles to about 1200 foot-candles.

In regard to *color quality of light*, we must realize that comparison plays a large part in color vision. When the gas-filled lamp was developed in 1913, its light was described as "practically white," because its predecessors,—the early tungsten lamp and the carbon lamp,—gave off a light which was distinctly ruddy in comparison. Yet a gas-filled lamp with a clear glass bulb, when compared with a blue bulb "daylight" lamp, gives off a light which is not white at all, but quite reddish. And, in turn, the light from a "daylight" lamp does not appear white when compared with the light from a "north sky" color matching unit. So our standard of "white light" cannot very well be based on artificial illumination. The obvious way out of this dilemma seems to be to define an approximately white light as meaning the color quality of daylight. This is what many surgeons have done, and it is logical that they should ask for a duplication of daylight, because for centuries the human eye has evolved, and its sense of color values has been built up almost entirely under daylight. So we turn confidently to a spectral analysis of daylight, and find the situation presented graphically in Fig. 1. Curve A shows that light from a blue sky has a marked excess of energy in the short wave lengths and therefore cannot claim to be the true "white" light. This conclusion may seem a little radical in view of the fact that north sky light has long been regarded as the standard for color matching, but it should be remembered that the principal reason for this was the *constancy* of north sky light rather than its spectral quality. Curve B, showing the energy distribution of noon sunlight, comes quite close to the perfectly flat line which represents theoretically white light. As the sun drops, the curves show that sunlight has an increasingly marked deficiency in the blue region, accompanied by an excess in the red region. While not

Shadows and Eye Strain Are Eliminated from the Operating Room

of practical value, it is interesting to consider that once in a great while,—when the sun shines through a film of clouds with just the right amount of the blue sky showing,—we actually have white daylight. The rest of the time daylight is not truly white. And it is far from constant in color quality,—a most annoying situation to anyone who seeks to make a duplication of daylight indoors. Energy distribution curves for the gas-filled lamp and the "daylight" lamp have been included in Fig. 1. Here they may be compared directly with the various daylight curves.

Thus far we have given separate consideration to intensity and color quality. As a matter of fact, they are almost too closely related for this treatment. For example, it has been found that without any change in the color quality of the light, color discrimination improves as the intensity is raised. Also, from the practical standpoint, it is noteworthy that color correction of the light from incandescent lamps is accomplished by means of absorption. Starting with a clear bulb lamp, we find that the light covers the entire range of the visible spectrum, but there is an excess of energy in the red region. The blue glass bulb of a "daylight" lamp makes a step toward balancing the energy distribution by absorbing part of the excess in the red region. This absorption amounts to about one third of the light emitted from the lamp filament. Where still further "color correction" of the light is made by means of enclosing globes of plates of dense blue glass, the absorption is still higher. To obtain the color quality of light designated as "noon sunlight," about two thirds of the light is absorbed, while for "north sky" quality about five sixths is absorbed. Therefore, whenever the color quality of the light is changed by a blue glass bulb or accessory, the wattage must be increased or there will be a marked reduction in intensity.

Floodlights of a Focusing Type Leave the Table Free from Shadows

Operating Rooms for Contagious Diseases Requires High Intensity Light

A considerable amount of space has been devoted to these matters because there are such conflicting opinions on them. One prominent company manufacturing lighting equipment for operating rooms is apparently convinced that by providing on the operating table several hundred foot-candles, of the color quality emitted by clear bulb lamps, the requirements of color discrimination are met. Another prominent manufacturer has long maintained that a color quality approximating theoretically white light is of such primary importance that it easily justifies the use of several times as much wattage. Perhaps the "daylight" lamp is a compromise between these two extremes. It seems that the subject offers a splendid opportunity for practical research, through the installation of a test system capable of providing a wide range in intensity, color quality, and distribution of light. Apparently no comprehensive investigation of this nature has ever been conducted.

Operating Room Lighting Systems. There have been many operating rooms in which the major source of illumination was an adjustable spotlight employing a single large lamp. From the illumination standpoint, the extreme contrast between the bright spot of light and the surrounding dimly

Color Correcting Glass is Used in this Major Operating Room

lighted area causes a condition of eye strain which usually manifests itself as eye fatigue and general fatigue of the surgeon. Also of importance is the fact that lamps burn out when least expected, and if the spotlight lamp fails during an operation, it leaves the surgeon without a high-intensity source of illumination. Further, adjustable mechanism sometimes fails to operate smoothly, and even under the best of care, particles of dust on the unit may be disturbed in the process of adjustment after the patient is on the table. These difficulties are overcome by the installation of a number of light sources properly placed at or in the ceiling above the operating table. The extremely bright spot is eliminated, shadows are materially softened, asepsis is assured, and the failure of a lamp during an operation is not serious.

Among the overhead lighting systems the direct type is best suited for this application. Indirect lighting, in which all the light is thrown upward against the ceiling, might also be considered. It is characterized by softness of shadows and absence of specular reflection from instruments and from fluids in a wound. While the diffusion is sufficient, so that light penetrates even a deep incision fairly well, indirect illumination has the disadvantage that there is no more light on the operating area than elsewhere in the room, and that unless the wattage is very large, the intensity is comparatively low.

It seems more logical to employ a system which directs most of the light to the operating area, at the same time providing sufficient illumination throughout the room to avoid extreme brightness contrast. Such a system provides excellent penetration for a deep incision, and by making the light sources of large area, the diffusion is markedly improved. The lamps can be circuited to permit wide flexibility in control, making it possible for the surgeon to have the predominant light come from whatever direction is best for the particular operation at hand. The ultimate operating room lighting system will probably be of the direct type, providing an intensity of around 500 foot-candles, of a color quality somewhere between noon sunlight and late afternoon sunlight. As previously pointed out, full research work along this line is yet to be done. For diagnosis and for minor operations, there is sometimes use for a portable stand lamp. With a good overhead lighting system, however, there is no occasion for the regular use of any portable lighting equipment.

Emergency Lamps. Every operating room should

Prismatic Glass Properly Arranged Provides Efficient Illumination for Operating

be equipped with an emergency hand lamp, supplied by storage batteries, for use whenever the power supply fails. Recently an operation in a Cleveland hospital, well lighted except for an emergency provision, had to be finished by candle light because the power cable supplying the hospital burned out. It is advantageous to have a luminescent front on the emergency lamp cabinet to indicate in the dark its exact position.

Lying-in Rooms. A lying-in room in a maternity hospital differs from an operating room in that the light should come largely in a horizontal direction, or within 45 degrees above the horizontal. For this distribution artificial "window" and "cornice" lights are often recommended. One accompanying illustration (page 922) shows a typical installation. Where this type of lighting cannot be employed, fairly good results may be obtained by the use of a large portable spotlight.

Private Rooms. In very few hospitals are the private rooms well lighted. This is somewhat surprising, because the problem is not difficult, and suitable lighting fixtures have been on the market for years. For general illumination an indirect or dense semi-indirect unit is recommended, as any other type becomes uncomfortably bright to the patient who must lie looking up toward it. The general practice of finishing the ceiling and upper walls in a light tone permits the use of indirect lighting without undue sacrifice in efficiency. In a small private room, a 100-watt or 150-watt lamp provides sufficient general illumination, while in the larger rooms a 150-watt or 200-watt lamp is recommended. For reading and writing in bed, the general illumination should be supplemented by some form of local lighting near the head of the bed. This lighting also proves useful for examinations and ministrations by doctors and nurses. Since floor lamps and table lamps are almost invariably in the way, properly shaded wall brackets, one on each side of the bed, are recommended for this service. In selecting the type of wall bracket, care must be taken to avoid glare. If the brackets are of the type in which the lamp bulbs hang downward, the shades should be small at the bottom so as to shield the bright bulbs from the eyes of the patient. If the lamp bulbs point upward, either cone-shaped shades or half-shades may be used. For brackets of both these types, 60-watt inside-frosted lamps are recommended. Recently there have been developed several good semi-indirect wall brackets. These are so well suited for use in hospital rooms that they will undoubtedly

Minor Operating Room with Prismatic Glass Projectors

Artificial Windows Used in a Delivery Room

be widely adopted for this service. Since wall brackets of this type contribute to the general illumination as well as providing local illumination, they should be equipped with 100-watt lamps. For night lighting of a private room, there are on the market several forms of overhead lighting equipment supplied from two circuits,—one bright and one dim. This arrangement is not entirely satisfactory, because even a dim overhead light is likely to arouse a fitful sleeper. It is much better to use a small lighting unit recessed in the wall about a foot above the floor. The sketch on page 924 represents a suggested design. Such a unit provides sufficient illumination for attendance to the patient by the nurse on night duty, without making it objectionably light in the room. For the use of electrical equipment, such as electro-cardiographs, heating devices, and portable examination lamps, a convenience outlet or two should be installed in the wall near the bed.

The foregoing comments on the lighting of private rooms have dealt with what might be called the practical side of the problem. We must not overlook the other side,—the æsthetic. There is no question but that a homelike atmosphere is conducive to general pleasantness and quick recovery, and lighting which adds to the attractiveness of the room as well as meeting the utilitarian requirements exerts a psychological influence which is beneficial to the patient.

General Wards. The lighting requirements of a general ward are substantially the same as those of a private room. The desirability of obtaining minimum brightness in the general lighting equipment,—especially in children's wards,—suggests the use of indirect lighting. Having total wattage equivalent to from 1½ to 2 watts per square foot of floor area is a good general rule to follow. Care should be taken that the wall brackets for local lighting at each bed do not cause glare in the eyes of those whose beds are along the opposite walls; the use of good shades or semi-indirect brackets is especially important on that account. Night lights and convenience outlets are needed here as in a private room. For wash basins, nurses' desks, medicine cabinets, and other details at which light may be required at night, it is desirable to employ lighting equipment having opaque or dense shades which confine light.

Corridors. For the lighting of corridors, good

X-ray and Therapy Rooms Require Good Illumination

Side Light Brackets Instead of Portable Lamps for Reading

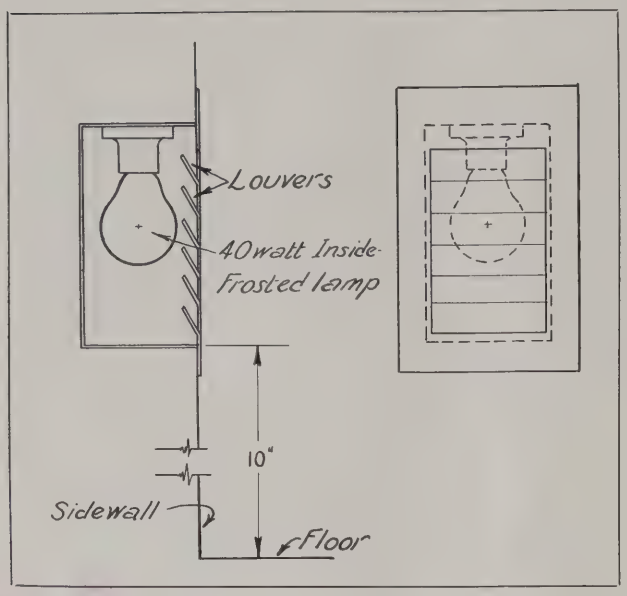
Diffused Light is Supplied in the Ward by Indirect Fixtures

results are obtained with equipment consisting of white glass or prismatic glass globes, completely enclosing the lamp. Equipment of this type has the advantage of high efficiency, and while it is too bright for comfort where it is in the field of view for any appreciable length of time, as in a ward or room, it does not become particularly uncomfortable during the short time it takes to wheel a patient through a corridor. Enclosing globes, mounted at the ceiling, spaced 15 to 20 feet apart along a corridor, and equipped with 150-watt or 200-watt lamps, are recommended for this service. For night illumination a few brackets or recessed wall units are sufficient. In most modern hospitals the nurses' call systems employ signal lights, but a discussion of this matter hardly belongs in an article on lighting.

Laboratories. The work in hospital laboratories is of a varied nature, and provision should always be made for a fairly high level of evenly distributed general illumination. Satisfactory results are obtained with enclosing glass globes, spaced not farther apart than one and one-half times their height above the work tables, and equipped with a total lamp wattage amounting to about 2 watts per square foot of floor area. There are some classes of work in the laboratory which require special lighting in addition to the general illumination of the room. One common example of this is found in microscopic laboratories. Here there is need for local lighting equipment consisting of a small box mounting a 25-watt or 40-watt lamp. On one side of the box is a frosted glass plate; the light passes through this plate and strikes the mirror on the base of the microscope, which is set at the proper angle to reflect the light up and through the slide under examination. A frosted blue glass plate may be used if it is desired to have light approximating daylight in color quality, for the inspection of colored slides and also for comparing slides under both artificial and daylight color qualities of light. Some of the later types of microscopes have small light boxes permanently installed on the bases of the instruments; in other cases the light

Indirect Lighting in Private Room

A Well Lighted Children's Ward



Night Lighting Unit for Rooms and Wards

boxes are part of the regular laboratory equipment.

Offices. Lighting equipment of the indirect or semi-indirect types is recommended for offices. With a good system of general illumination, there is no need of individual desk lamps, with the attendant glare, specular reflections, and bothersome shadows. A total of about 3 watts per square foot of floor area should be installed in the overhead lighting system.

Reception Room. The hospital reception room is no longer a bleak and uninviting place. While not a "sales room" in the usual sense of the word, the reception room is relied upon to create a favorable impression of the hospital in the minds of entering patients and visitors. In nearly every case the room is comfortably furnished, and much thought is obviously put on the decorations, the interior finish, and the design of its doorways, windows, and other architectural features. Recognition is given to the importance of the lighting in that it is not unusual for the lighting equipment to be specially designed to harmonize with the motif of the room. In this connection there are two points which it seems to me ought to be mentioned. One is that even though the lines and proportions of a fixture are excellent, if the lamp bulbs in it are unshaded it loses a large part of its attractiveness when lighted. The trend toward use of shaded light has resulted in the addition of shades to many formerly unshaded ceiling and wall fixtures, and the selection of the shades has not always been given proper care. The very fact that a fixture is of sufficient importance to be specially designed is a convincing argument that the original design ought to include a shade which will be in perfect harmony with the fixture. The second point is that frequently the wattage employed in a reception room is too low. There is no need of a high level of illumination in a hospital reception room, but neither should it appear dimly lighted. Gloom is closely associated with gloominess, and that is "bad medicine" for the incoming patient.

There is no particular problem in connection with the lighting of the hospital rooms not already covered,—kitchens, dining rooms, laundries, sterilizing rooms, toilets, utility rooms, and similar places. In every case it is simply a matter of supplying reasonably uniform illumination, with an occasional local light at important working places.

Lighting Cost. The cost of a lighting system is an item which always comes in for close scrutiny when specifications are being drawn up. Lighting is like most other things,—however much or little you spend, you just about get value received. Taking a broad view of the matter, everyone agrees that any expenditure which is at all within reason is justified wherever human life is at stake. For an operating room, it certainly does not seem exorbitant to spend about as much for a good lighting system as for sterilizing equipment. And the cost of burning the lights,—including lamp renewals and current,—might be about equal to the cost of the gauze and bandages! Speaking from the standpoint of one whose contact with hospitals is not as impersonal as could be desired,—during the past three years my own "investment" in surgeons and hospitals just misses four figures,—good operating room lighting is worth far more than it costs. Yet hospital building funds have a habit of being more or less inadequate to make the dreams of the medical boards come true, and lighting costs must stand the scrutiny along with everything else. The result has been that in several modern hospitals the operating rooms have been equipped with excellent artificial lighting systems, with only enough window space for ventilation and for light to clean the rooms. In this way the total lighting cost is little if any more than it would be for good natural lighting and indifferent artificial lighting. In some cases the elimination of windows in an operating room offers the further advantage that the student observation space is about doubled. In private rooms and wards the additional cost of good lighting over mediocre lighting is not large in comparison with the charges made by hospitals.

There is one last suggestion to those who have taken the trouble to read through this rather lengthy article. The suggestion also applies, by the way, to those who started the article and then skipped to the last paragraph to see whether it had a happy ending. It is this: install wiring which is adequate not only for the present needs but also for probable future needs. In factories, offices, and stores,—as in hospitals,—the wattages installed today are double or triple or even quadruple those installed just a few years ago. If the outlets are properly installed as regards both spacing and sizes of wire, then a change in reflector type or lamp size may be made with ease. But if there is an insufficient number of outlets or if the wiring is inadequate, then every change in lighting becomes a "major operation," with attendant cost.

ELECTRICAL EQUIPMENT FOR HOSPITALS

BY
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ELECTRICITY continues to be one of the greatest aids to modern life, not only from the standpoint of utility, but also in our leisure moments, and at no time can electricity be of greater service than during illness. Electricity properly used produces cold and heat, the cheer of a brightly lighted room, or only the dim light which may enable us to perform our duties when the usual brilliance is objectionable. Electricity properly used relieves us of much physical labor in performing our daily tasks; it allows us to communicate with our friends at distant points, so heartening during illness, and in our convalescence it brings us entertainment by the leading artists and musical organizations. Electricity through the marvelous, invisible X-ray assists the physician and surgeon to observe conditions within the body, so that they may apply the remedy.

Sources of Electricity. The proper equipment of a hospital to utilize to advantage all the possibilities of the various applications of electricity is of the utmost importance. The first consideration in a logical development of the subject should be given to the source and form in which electricity is to be supplied. At the present time there are few places where it is not possible to purchase satisfactory service from a reliable public utility corporation. If the hospital is sufficiently large and if the grounds provide space for a separate building, it may be desirable to install an isolated plant for this purpose. The employment of a separate building to house an isolated plant is an important point, as it is practically impossible to operate such a plant without some noise and vibration, both of which are especially objectionable in an institution of this kind. Besides the question of isolation to prevent disturbance, there is the question of the cost of supplying the service. It is not feasible without considerable expense to store electrical energy, so it becomes necessary to operate the generating apparatus continuously, which involves constant attention. The necessary labor for this purpose involves frequently such a large expense that the cost of generating electrical energy may prove to be much greater than the cost of purchasing it. No fixed rule can be given to determine whether or not an isolated plant should be installed, and it therefore becomes advisable that a competent engineer be employed to make the necessary calculations and recommendations to decide this matter.

Electrical power is usually furnished by one of two forms of current,—direct and alternating current, commonly spoken of as "D.C." and "A.C." Nearly all forms of electric lighting units and heating units may be operated by either form of current, but motors, X-ray apparatus and some other forms of equipment are definitely designed to be operated by one or the other of the two kinds of current. It is, therefore, necessary to make a decision as to the kind of current which is to be used. If an isolated plant is to be installed, apparatus to produce either form of current may be readily obtained. Each form has its advantages and its disadvantages. The principal advantage of the direct current is that motors may be designed to be operated by it at very slow speeds, thus allowing the direct connection of the motors to the driven apparatus. Slow-moving machinery is always less noisy than that which is running at a high rate of speed, and it is always desirable to be free from the use of belts in connecting motors and the driven machines. Direct-current apparatus is also quieter than alternating-current apparatus on account of the absence of a humming noise which frequently accompanies the operation of the latter type of machinery.

While alternating-current motors are simpler in construction and therefore cost less for maintenance, the chief reasons for the use of alternating current are the advantages it possesses for the public utility company in its generating and distributing. If the electricity is to be purchased, moreover, it will be found that in most cases only alternating current is available, and this may be used with entire success. Before the selection of apparatus for a hospital, the characteristics of the current to be supplied should be definitely ascertained and specified when securing information or ordering apparatus. Alternating current will be distributed by a public utility company at a voltage much higher than can be used directly at the lamps or other apparatus, and it is necessary that suitable devices for transforming the voltage of this current should be provided.

Distribution System. After the decision has been made as to the source and character of electrical power, the next consideration is the distribution system. If an isolated plant is to be installed, then a main distributing switchboard will be installed in the generator room from which feeders must be carried to the different parts of the hospital. It is advisable to provide separate feeders for light and power. It will also be necessary to run separate feeders for X-ray equipment. One or more feeders for lights should be carried to each building, and it is also advisable to make such interconnections that the failure of a feeder will not deprive any building of its supply. If the power is purchased, a main distributing switchboard should be located at some central point from which feeders should be run to the different parts of the hospital, as previously described. The feeder cables should be drawn into conduits which may be installed in a pipe tunnel between the main switchboard and the centers of distribution in each building or in conduits which are

installed entirely outside of the pipe tunnels. The author prefers, where possible, to provide the separate duct lines, as pipe tunnels are usually much congested with the steam, water and plumbing pipes, and the high temperatures which are usually found in pipe tunnels may cause deterioration of the insulation of the feeder cables. The separate duct system will be more expensive, but unless it is necessary to reduce the cost to the lowest limit, the expense is justified.

A subsidiary switchboard must be located in each building, from which mains will run to centers of distribution in different parts of the building, at which centers there should be groups of fuses in cabinets to protect the smaller groups of lamps and motors. If possible, it is advisable to place the fuse cabinets for tap circuits near enough together so that no group of lamps will be more than 75 or 100 feet from a cabinet.

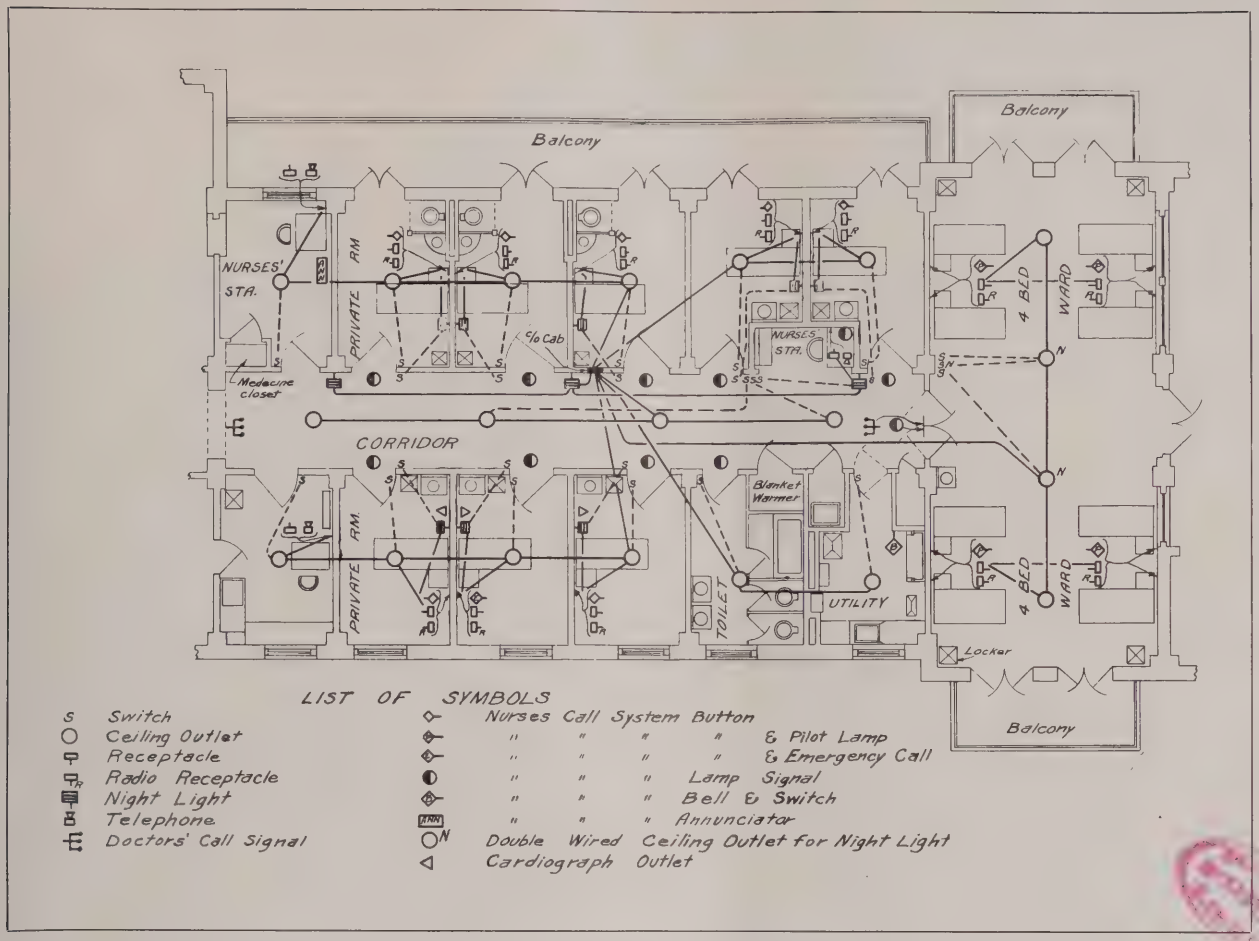
Power Equipment. In practically all hospitals there will be a number of motors for driving fans, elevators, kitchen equipment, etc. Special care should be taken that the noise and vibration of motors shall not be transmitted through the structure to distant parts of the building. Motor foundations should be sufficiently massive to absorb the vibration, and these foundations should be separated from the building structure by material such as sheet cork, compressed fiber blocks, etc., which will prevent the transmission of the vibration from the foundation to the building. All anchor bolts which must be attached to the building structure for holding motors and moving machinery in place, must be separated by suitable deadening materials in the form of fiber bushings and washers so that no part of the machine will be in direct contact with these bolts or supports. Motor starting apparatus, especially for alternating current, is often a source of annoyance, and it should be mounted away from the steel frame of the building or isolated from it by fibrous material.

Each direct-current motor larger than ¼ h.p. should have a safety knife switch and an enclosed type motor starter. The writer recommends the automatic type of starter with push-button station, even if the starter is located beside the motor, in order that the rapidity with which the motor is brought up to speed may be adjusted to the proper rate and not left to the devices of a careless operator. The starter should provide overload and no-voltage protection. The writer does not think it advisable as a general practice to have motors started from a distance when the operator cannot see the motor, but thinks it advisable to have the engineer see the motor every time it is started; otherwise, there may be a tendency to neglect the machines. When necessary to install motors in places to which access is difficult, then a push-button starter for starting the motor may be placed at a convenient point. A motor which is started from a distance should have a safety type switch and a push-button station located at the motor so that a mechanic at work on the machinery may protect himself from injury by disconnecting the motor so that it cannot be started until the work is completed. The push-button station enables the mechanic to test the operation of the motor and observe its action without leaving it. Alternating-current motors up to 5 h.p. capacity should have a starter of the hand-operated type with thermal cut-outs or thermal relays to protect the motor against overloads; motors larger than 5 h.p. should, in general, be provided with a safety type knife line switch and a starting compensator with overload and no-voltage protection. Alternating-current elevator motors should be protected by a reverse energy relay and circuit breaker which will disconnect the motor from the supply should the phase rotation of the supply be changed.

Signals and Communication. A hospital should be equipped with telephone connection between the superintendent, the service rooms, nurses' duty stations, doctors' and internes' rooms, and to the local exchange of the telephone company. It is becoming common to provide for telephone connection from patients' private rooms to the commercial system by the use of portable instruments plugged into outlets in the rooms.

Nurses' Call System. Means should be provided by which a patient may call the nurse. The system usually consists of buttons at all beds, a signal lamp or annunciator at the nurses' duty station, a signal lamp and bell in diet kitchen or utility rooms, and signal lamps in corridors over doors of wards and private rooms, to which may be added a supervisory annunciator at the head nurse's or superintendent's office and a device which will record the elapsed time between the making of the call by the patient and the time when it is responded to by the nurses. There are several systems available, some of which use the 110-volt lighting current to operate the lamps and other apparatus, while other systems use batteries, or use transformers to cut down the lighting voltage, so that the voltage used will be from 6 to 24 volts.

In a hospital with several floors on each of which there are wards containing several beds and a number of private rooms, there would be a nurses' duty station on each floor and one or more rooms such as a diet kitchen, utility room, etc.; the equipment would consist of a button outlet by each bed in wards and private rooms, at each outlet a receptacle and plug with cord and button, the cord being long enough to allow buttons to lie on the bed or table within reach of the patient. At outlets by beds in wards having two or more beds there would also be a pilot lamp behind a colored jewel set in the plate with the button receptacle. At each bed outlet there is also a button or other device by which the nurse answering the call can cancel the signal. In the corridor over or beside each room door there would be a signal lamp. In diet kitchen and in each utility room there would be an outlet with a signal lamp, a single-stroke bell, and a switch which will silence



the bell when this is desirable. At the nurses' duty station there would be at least a signal lamp and frequently an annunciator to indicate the point from which a call is made.

When a patient pushes a button, if he is in a private room, the signal lamps in corridor, in diet kitchen and utility rooms and at the nurses' duty station are lighted simultaneously, and each bell makes a single stroke. The nurse seeing the flash of a signal lamp or hearing the sound of the bell looks down the corridor and sees by the signal lamp by the door, from which room the call came. On arriving at the bed she cancels the call by pushing a button in the outlet plate or releasing the button. The only difference in the operation of the system in case the call was made by a patient in a ward with several beds, is that the signal lamp at the button outlet is also lighted to direct the nurse to the particular bed from which the call was made. The nurse on arrival cancels the call as already described. It is sometimes desirable to equip a few of the button outlets with an emergency call. This consists of a button in the outlet plate to be operated by the nurse, should she find assistance necessary. The operation of this button lights a red lamp in the corridor over the room door, rings bells at the duty station and in the utility rooms, operates a floor indicator, and rings in the superintendent's office.

Call Systems. In order that doctors, the superintendent, head nurses or other officials visiting the wards may be reached when necessary, there should be a calling system which will notify each person to call the telephone switchboard operator who can give the required information. Such a system may consist of a telephone transmitter by means of which loud speaker telephone receivers located in the various parts of the hospital will simultaneously repeat the call made by the operator. This type of call is sometimes considered undesirable because of the sound. Other systems which operate silently consist of lamp signal annunciators placed at duty stations and at various positions in corridors where the person to be called might pass. A bank of buttons at the calling point operates the annunciators, on each of which a number, a name or some symbol is shown. Each person who may be called is assigned some special call, and on seeing his signal is expected to go to the nearest telephone and call the operator to find out what is wanted. In another system groups of lamps are placed at various points as are the annunciators just mentioned. A device at the transmitting point causes lamps to flash a code signal. Each person to be called is assigned to a signal and is expected to communicate directly with the operator by telephone, as already explained. It has been found that the flashing signal will attract the attention more quickly than the indicator or annunciator will do.

The wiring for nurses' and doctors' calls should be done as carefully as the wiring for lights and motors. If current at a potential in excess of 24 volts is used to operate the system, no wires smaller than No. 14 may be used, but if potentials of less than 24 volts are used, No. 16 or No. 18 wires may be used if runs are of moderate length. It is desirable to use no wire smaller than No. 16. All wires should be rubber-covered and be pulled into iron conduits built into the structure. No joints should be allowed in wires, but all wires should be connected through suitable connecter strips placed in accessible cabinets. A cabinet should have a directory indicating the location of the other end of every wire entering, and the system to which it belongs.

Diagnosis and Treatment Equipment. Electricity is applied to the diagnosis and treatment of cases in various ways, such as, through X-ray cabinets containing a large number of incandescent lamps, the patient being seated in the cabinet; cauteries; and the electric cardiograph. Heating pads may also be required. Probably all hospitals except the smallest will have rooms fitted for examination by X-ray. It is advisable to provide alternating current for this purpose. The wires supplying X-ray machines should be not smaller than No. 1 or equivalent for each machine, and if the runs are long, larger wire must be used. Modern X-ray apparatus requires wiring for controllers placed at a distance from the transformers and tubes, and as different makes of X-ray apparatus differ in their needs, the manufacturers should be consulted before attempting to lay out the detailed wiring for this apparatus.

A large hospital will have several sets of equipment requiring considerable wiring. The connections between the transformers and the X-ray tubes carry current at extremely high potentials, in some cases over 200,000 volts. The work will always be done by the manufacturer of the apparatus. As it is frequently necessary to make X-ray examination at the patient's bed, 30-ampere receptacles should be installed in the corridor on each floor at two or more places so that the distance from any receptacle to any room will not exceed 50 feet. Current should be supplied to these outlets at 220 volts. Use wire not smaller than No. 6 to feed the receptacle in any vertical line. These circuits should be connected to the alternating-current supply. Although not a part of the electrical equipment, the architect should not overlook provision for shielding the operator and all others except the patient from the X-rays by heavy lead linings on partitions and floors surrounding X-ray rooms.

The electrical equipment for a hospital should include plate or viewing boxes in the X-ray department and in all operating rooms. These viewing boxes consist of cabinets containing incandescent lamps with reflecting surfaces which will so direct the light from the lamps that diffusing glass fronts of the boxes will be brightly and uniformly illuminated. Suitable provision is made to hold the X-ray films in front of the illuminated glass so that the details may be readily seen. The wiring contacts should provide receptacles to which the boxes may be connected. For the light cabinets, circuits of wires not smaller than No. 8, and 30-ampere receptacles should be provided.

The electric cardiograph is an instrument by means of which the extremely small electric currents generated by the movements of the heart may be made apparent to the physician. The indicating apparatus, which is a very sensitive galvanometer, is located at a convenient point and cables are run from this point to operating and examining rooms. The manufacturer of this apparatus will furnish receptacles to be installed at the examining points, connection blocks for connecting branches from the main cables to it, and the special cables which contain the wires for conveying the small current from the patient to the indicating instrument, and also wires for telephonic communication between the doctor at the patient's side and the operator of the indicating instrument. The cables must be pulled into conduits like other wires, but they should never run paralled to alternating current circuits which are nearer than 3 feet, and they should not cross such circuits at less than 8 inches away from them. They should be kept as far as possible away from wires carrying large currents, and they should never be run in elevator wells.

Ground Wires. It is considered necessary by some to provide in each operating room a binding post connection to a wire which is permanently grounded, from which a wire may be run to the frame of the operating table. Convenience outlets should be liberally provided in wards, private rooms, examination rooms, etc., each outlet being equipped with a duplex receptacle. A diet kitchen should have one or more outlets equipped with a receptacle switch and pilot lamp, each outlet being supplied by a separate circuit. These outlets may be found very convenient for the use of stoves, water heaters, etc.

Radio. The radio which brings pleasure to so many is an important part of hospital equipment. It is customary to provide for two receiving sets and amplifiers, and to run two sets of wires to outlets at each bed, to the rooms of the internes and nurses, and to the recreation room of the servants. At each outlet there should be installed a plate with two receptacles for plugs for a head receiver or loud speaker. The two sets of wires may be run in one conduit, but it is recommended that one pair be enclosed in a lead sheath. A twisted-pair telephone wire is suitable for a number of stations which are connected in parallel. Loud speakers can be used only in the recreation rooms of the staff and servants, and head receivers for patients, in order to avoid possible annoyance to some.

THE HOSPITAL HEATING AND REFRIGERATING PLANTS

BY
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CONSULTING ENGINEER

BEFORE the architect can decide upon the type and design of the several engineering utilities entering into the hospital he is to plan, he must consider the size and purposes of the project, its location and proximity to labor markets, and whether the operating personnel is to be drawn from an urban or a rural community. Consideration of these and possibly other factors should enter into the calculations of not only the building arrangement, but also of the heating and ventilating, refrigerating, plumbing, laundry, electrical and equipment installations, and along with these (and of prime importance) the probable operating personnel.

Quite naturally, the small hospital of 50 beds or less will require different treatment from one to house 200 or 300 patients. In the care of the plant after it is turned over to the owner, the small hospital will probably employ but one engineer, who must be a jack of all trades and reasonably expert at each. He may be expected to operate the laundry machinery and the refrigerating plant, if any there be; to attend to the upkeep of the piping and radiators, sterilizers, electric light wiring, the nurses' call system, etc. The larger hospitals will of necessity employ a greater number of and possibly better trained aids, in which case the qualifications of those employed in the mechanical operation of the plant are likely to be subject to statute or local ordinance, and not at all unlikely also, to the demands of the labor unions! It therefore behooves the designer to make a careful survey of the field before committing himself to any type of mechanical design. In no class of building is there greater need of the specialist than in the designing of the hospital and its equipment. Bear in mind that after the building is completed it will be turned over to a corps of men and women expert in their several professions, who know what is required of the plant provided for their use and who will also know whether or not it functions properly. In this brief article the endeavor will be to assist the architect in the selection of engineering materials and in the general design of the plant, subdivided into: 1. Plant Materials; 2. Heating and Ventilation; 3. Refrigeration; 4. Fire Protection.

Materials

Pipe. The quality of the materials will be governed in some measure by the funds available. It is considered good engineering, and wise economy also, to install in steam and return lines the best non-corrosive pipe for the purpose. A small saving may be effected if the steam supply lines are not of such high grade, but all return and drip piping should be of the best, as should all concealed piping. The extra-strong pipe in the usual heating system is not specified for the increased strength that may be secured, but that it may withstand corrosion for a longer time, owing to the greater wall thickness.

Valves everywhere in the plant should be of the highest grade. In the boiler room and in the main piping elsewhere, the principal valves,—3-inch and larger,—should be of the rising stem type, because at a glance the engineer can see whether they are open or closed. Globe pattern valves should be installed where there is the necessity of controlling the volume of steam or water, and gate valves elsewhere. Fabrication of pipe lines by the welding process is fast becoming the custom. This may be done usually at a lower cost than by the older method of connecting pipes through flanges, unions and fittings, in sizes of 2 inches or 2½ inches and larger. The elimination of joints in pipe lines makes for lower cost of upkeep, greater rigidity, less weight, and freedom from leakage. New connections to existing pipe lines can be made in less than half the time and at much less than half the cost where a system of welded piping is installed. It is poor economy to install smoke connections of light weight. If low-pressure boilers are installed for heating purposes only, as would probably be the case in a small hospital, the boilers will usually lie idle for three or four months each year, and corrosion of smoke connections will be rapid; therefore, it is recommended that the connections from boilers to chimney be of not less than No. 12 steel, and in the larger plants somewhat thicker.

Radiators are generally of cast iron of open pattern. The more recent fin types of concealed radiators are efficient but may not lend themselves readily to ease in cleaning, and in hospitals, above all other considerations, cleanliness should be paramount in importance. For many years cast iron radiation, known as "hospital type" has been generally employed, and this pattern is today believed by many engineers to be unsurpassed for hospital purposes owing to the ease of cleaning. A newer pattern, the "tube type" radiator, is offered as a substitute, and some makes appear to be suitable for hospital use. In the better class hospitals, legless radiators are almost invariably specified, but the installation cost is greater. Leg pattern radiators make it more difficut to clean under and at the backs.

Insulation of all hot surfaces is essential on the score of economy, for one thing, and to avoid the overheating of rooms through which steam pipes pass. Hospital superintendents invariably complain of the overheating of the wards. To partially remedy this situation it is well to insulate the mains and risers in all bedrooms. Concealed risers should always be insulated. First class work calls for 85 per cent magnesia insulation, in standard thickness up to 50-pound steam pressure, and 1½-inch thick-

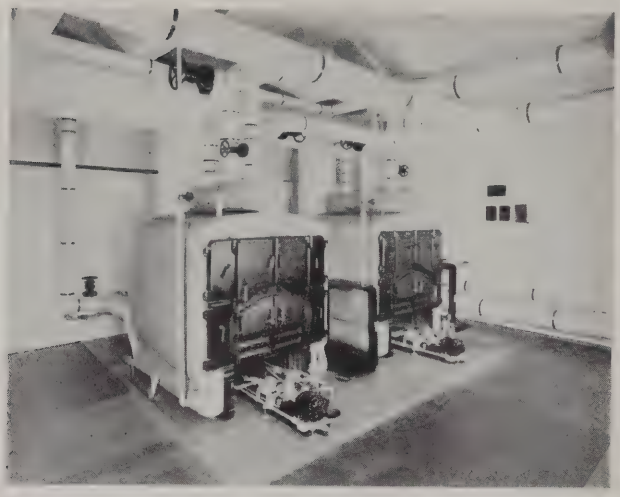

Fig. 1. Boiler Installation with Oil Burners

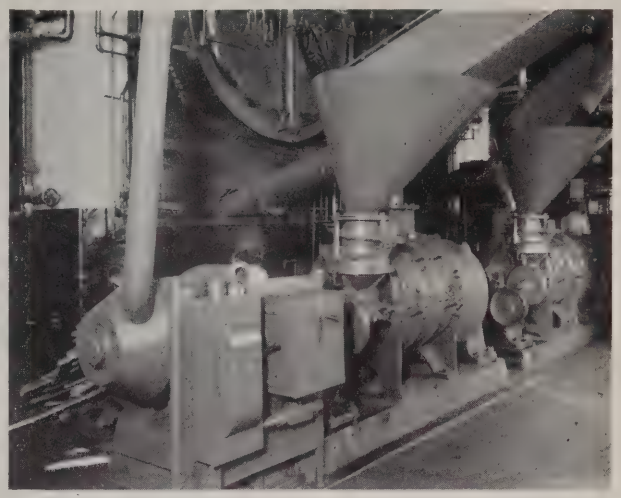

Fig. 2. Soft Coal Pulverizer and Feeder

ness for greater pressures. The strictly low-pressure heating pipes may be insulated with the better class asbestos air cell covering at a small saving in cost, but it should be of not less than the 4-ply thickness with 5-ounce canvas jacket,—*not* 3-ounce which is "standard." The latter covering would ordinarily be used in small hospitals or where first cost must be considered. Heating returns are frequently left uncovered through the reasonably warm basements, especially with a vacuum system of heating.

Flues and ducts may be built of masonry or sheet metal,—usually the latter. They should be rigid, with all exposed edges wired and openings into rooms left open. Hoods are regularly placed over kitchen ranges, kettles and steamers, also over dish washers and sterilizers, and frequently in laundries over washers, drying tumblers and ironers. Such hoods are usually built of sheet metal of substantial design, and the heat and steam are withdrawn by exhaust fans. Registers and grilles collect dirt and are rarely removed for cleaning. If control of the flow of air is necessary, one may install dampers of the friction pattern located in accessible places, wherever this is practicable. The ventilators and exhaust flues from the chemical laboratory fume hood or cabinet, should preferably be made of some non-corrosive sheet metal or clay tile, and the exhaust fan of non-corrosive metal. Ventilators should be built of copper.

Heating and Ventilation

The type of heating and ventilation to be installed will depend upon the class of hospital under consideration. It is not so many years ago that it was considered necessary to provide *every* hospital with a complete system of fans and ducts for supplying fresh air to each room, and for the removal of air therefrom. Just now, however, the pendulum has swung pretty well to the other extreme, and it is a question if it has not swung too far. Today, only hospitals for contagious diseases, hospitals for the insane and feeble minded, and special rooms in every class of hospital, are provided with indirect systems of heating and ventilation; direct is used elsewhere.

In any hospital there are certain rooms that from the natures of their purposes should be supplied with exhaust fans or, at any rate, with ducts and flues for ventilation. These in general, are the laundry, all kitchens and serving rooms, sink or utility rooms, the X-ray suite, dark (X-ray photographic) and transformer rooms, clinic, autopsy, sterilizer, plaster, anæsthetizing and operating rooms; all laboratories, delivery rooms, and the nursery or creche; all general and private toilets and bathrooms located away from outside building walls, and preferably wherever located. The removal of the air from these rooms may be in many cases by gravity, provided however, that the vent flues lead direct to the roof or at most with but a short offset. Certain rooms, on the other hand, will not be considered properly ventilated unless the air is removed by fans. These are the operating and X-ray rooms or suites, chemical laboratory, the autopsy room, maternity suite, main kitchen, and laundry. In some instances, however, hospital authorities require all rooms to be ventilated by mechanical means, but this is quite unusual at the present time.

Private rooms and two-bed wards are seldom provided with fresh air other than through windows, and no ventilating flues are installed for these rooms, but in wards with four or more beds it is usually found necessary, for the sake of harmony among the patients, to provide means for control of each unit of the heating, air supply and ventilation. As to temperatures, these also vary, but in general, a temperature of 70° is considered proper, *except* in operating rooms, labor and delivery rooms, and the nearby nursery; also in the dressing rooms connected with the X-ray department, hydrotherapy and patients' shower rooms. These should be capable of being heated to 80 or 85°,—both summer and winter,—at the lowest outside temperature for the locality. In such rooms, and in the administration offices, the control of the temperatures should be automatic where the appropriation for building will per-

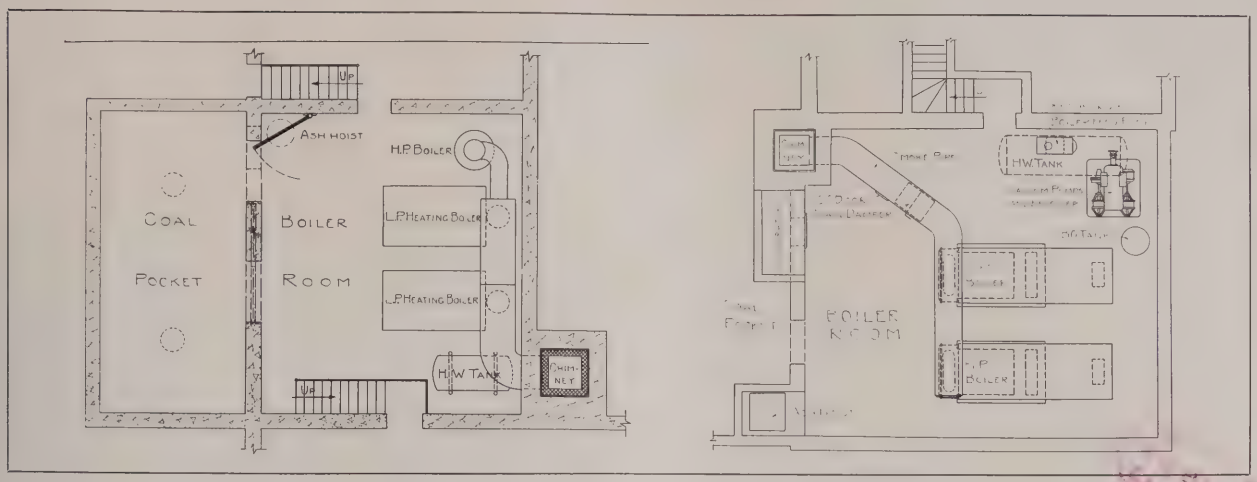

Fig. 3. Boiler Room Plan for Small Hospital

Fig. 4. Boiler Room Plan for Large Hospital

mit. In all patients' rooms hand control of radiator valves is considered the most practical.

Air conditioning of the premature wards in children's hospitals is frequently required. The chief value of air conditioning is the resulting stabilization of the body temperature, and this is accomplished by maintaining uniform temperature and humidity adjusted to the physiological needs of the infants. The conditions best conducive to the requirements are dry bulb temperatures varying from 75 to 88° and 65 per cent relative humidity. From 30 to 50 air changes per hour are needed, and automatic control of temperature and humidity is imperative.

Boiler Room Installation. If the hospital is not larger than of 50- or 60-bed capacity, the boilers will probably be of the low-pressure cast iron type for heating the building and the domestic hot water supply. For supplying steam for the sterilizers and kitchen, a high-pressure steel boiler will usually be employed, or this equipment may be provided for by the use of city gas or electricity. The high-pressure boiler installation will be found to be the most economical to operate, and it may also be used in the summer to heat the domestic water supply and the operating and maternity suites, thus obviating the installation of a coal or gas heater for the purpose. In a larger hospital or one operating a laundry, it will be better to install high-pressure boilers only, and these in duplicate. Such boilers will provide steam at from 80 to 100 pounds pressure for the laundry, and through suitable pressure-reducing valves at 60 pounds for the sterilizers and water stills, and at 30 pounds for the kitchen and again at 5 pounds or less for heating. The domestic hot water will be heated from either the 5-pound or the 30-pound line as most convenient. Exhaust steam from engines or pumps may be available and for economic reasons will be used.

The system of heating the building will usually be either by hot water, low-pressure steam, one- or two-pipe with gravity return *direct* to the boilers (termed a "closed system"), or low-pressure steam with gravity return pumps which in turn deliver the water back into the boilers. In place of pumps the condensation may in the smaller buildings be returned by boiler return traps direct to the boilers, while in hospitals of considerable size a vacuum return system will probably prove the best from an economical and operating point of view.

Hot water heating of small and medium-sized hospitals is seldom employed. Where installed, it will usually be a "forced" hot water system. The so-called "closed" system of low-pressure steam heating will probably not be installed in other than the very smallest cottage hospital. The types of heating, variously known as "vapor" or "modulation" systems, where properly installed, give generally satisfactory service. If ample fall to the boiler room for the condensation is possible and if the runs of piping are not too long, there will be no necessity of installing a vacuum pump, as what is termed a "condensation pump" will serve quite as well.

Architects and contractors alike should have it fully impressed upon them that the successful operation of any vapor, modulation or vacuum heating system, depends *wholly* upon the uniformity of the pressure of the steam supply to the radiators. With properly sized pipe connections and radiators fitted with fractional valves that may be partly closed at will, room temperatures may be very accurately controlled. This depends upon just two things,—sensitiveness of the damper regulator or pressure-reducing valve and the occasional adjustment of the radiator supply valves. Quite recently a system of high (and variable) vacuum heating has been made available to the designer, whereby room temperatures may be quite accurately maintained to meet variations in outside temperatures. This is accomplished by varying the vacuum carried on the return lines and the pressure in the supply lines. Properly installed and competently operated, this system should effect marked savings in fuel, and secure a high degree of temperature control. In the very low-pressure heating installations it is well to carry 10 to 15 pounds pressure on the boilers *all* the time and through a proper valve reduce the pressure for heat-

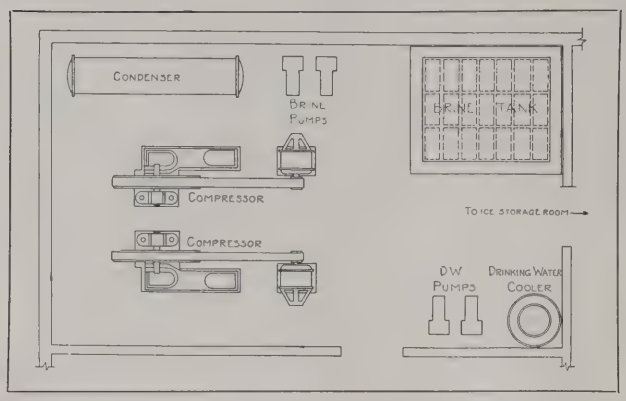

Fig. 5. Plan of a Central Refrigerating Plant

ing to a few ounces. Thus a wide variation in boiler pressure due to intermittent firing will not affect the heating pressure upon which successful temperature control depends.

A vacuum system of heating will probably be considered in larger installations, where condensation must be lifted from lower levels, or where extra long lines of return piping must be drained back to the boilers. The accuracy of temperature control of the radiators depends upon a uniform and unvarying steam pressure.

High-pressure steam, varying from 30 pounds in the kitchen to 80 pounds in the laundry, is needed in all but the smallest hospitals. In the laundry this pressure is required during the daytime only, and it is quite the custom to carry but from 50 to 60 pounds pressure on the boilers at other times for the sterilizers. Steam and return piping connections are made to the laundry, kitchen and sterilizers of sizes to meet the needs of the equipment furnished. It is a trade custom that the heating contractor shall furnish and install all the traps, valves, etc., needed to connect the laundry and kitchen equipment. The sterilizers and distilled water equipment, however, should be supplied by their makers with *all* the traps, valves and immediate piping, all nickel plated and brought to a convenient point for connections by the steam heating contractor.

The boiler room, in the small hospital, will probably be located in the basement. For obvious reasons this room should be built as nearly fireproof as it is possible to build it. If located in the hospital it should be as convenient to the service entrance to the building as possible. It should also have an entrance from outside the building, and *all* entrances should have self-closing firedoors. The boiler room in any case would be better housed in a separate building, and in the larger hospitals this becomes more important. By placing the boiler, refrigerating and laundry plants in a separate building, the fire risk is reduced, and the dirt and attendant noise greatly lessened,—and these are important considerations. If possible, the coal storage space should be placed outside the building or boiler house and be of such design that coal trucks may drive over it and discharge the coal therein with little or no handling. Quiet about a hospital is indispensable, and patients should not be disturbed oftener than necessary. Fig. 3 is a plan of a small boiler installation suitable for the smaller hospital of 50 or fewer beds. Fig. 4 is a suitable plan for hospitals of from 50 to 100 beds.

The low-pressure cast iron heating boilers or steel boilers suitable for high or low pressure, together with the boiler piping, hot water tank, heaters, and pumps, should be installed in the simplest manner to accomplish the desired results. In the small hospital it is good judgment, on the score of economy and convenience of operation, to incur extra expense (if necessary) to secure simplicity in installation, keeping in mind the probable lack of skill of the attendants the hospital is likely to employ, and the multiplicity of duties that fall to the lot of the engineer.

Steel boilers will usually be brick-set, and it is poor economy to permit use of an indifferent quality of brickwork for the small first cost savings that may be effected. Poor settings mean leakage of cold air into the combustion space, a lowering of the temperature of the gases, low boiler efficiency, and waste of fuel. Coal, oil or possibly natural or artificial gas may be the proper fuel to burn, depending upon the cost of each in the particular locality. Gas and oil fuels cause less dirt about the building; fires may be started more quickly, and there are lower standby losses than when burning solid fuels. Where soft coal is burned, a larger combustion space in the boilers is required, which means greater height in the boiler room due to setting the boilers higher. Horizontal return tubular boilers should be set with the distance from grates or stoker to shell of about 3 feet, 6 inches in the 48-inch and 54-inch sizes, increasing 4 inches for each increase of 6 inches in boiler diameter. Fig. 1 is a good illustration of a low-pressure cast iron boiler installation burning oil fuel. Fig. 2 shows a unit soft coal pulverizer and feeder for the larger installations. Such an installation is suitable only for a hospital with a detached boiler house. Scales for weighing coal should be provided, and many patterns are obtainable.

An incinerator will probably be built in the boiler room except in the smaller hospitals. These are usually brick-set and fired with coal, gas or oil, although there is usually enough combustible refuse available to burn the garbage. In the smaller hospitals the refuse is either burned in small gas- or coal-fired incinerators, locally placed, or is taken in suitable containers and burned under the boilers. In such plants the kitchen wastes are collected daily and carted away to be disposed of.

Refrigeration

Refrigeration in hospitals is fully as essential as heating, and in all but the very smallest hospitals it will be obtained by artificial means. Natural ice may be used in the very small hospitals in country districts, where a good quality of ice is abundant,

but even in such locations, artificial ice is coming more and more to be used. Refrigeration is of course needed for the preservation of food stuffs at temperatures of from 32 to 36° for meats, fish, etc., and of from 34 to 38° for dairy products and vegetables. Fruits are best kept at a slightly higher temperature, or at about 40°. These temperatures apply to commodities for current use. Where they are to be stored over long periods, slightly lower temperatures would be required.

Where garbage is kept temporarily awaiting removal by teams, the temporary storage room should be refrigerated to about 32°. Refrigeration is also extensively employed in the laboratories where sharp freezing for microscopic work, at from 5 to 10°, is required; also in hardening ice cream at from zero to 5° after its manufacture; in the cooling of water for drinking purposes at from 40 to 45°, and for maintaining a temperature of 64 or 65° in the developing and fixing solutions in dark rooms where X-ray negatives are developed. The mortuary cabinets require refrigeration to about 32°. Air conditioning also requires the extensive use of refrigeration for operating rooms and premature wards of children's hospitals, but the details of their installation are too extensive to be described in a short paper. Ice is used in hospitals principally in making ice packs. For this purpose it is usually crushed in the ice-making room and kept in compartments of the diet kitchen refrigerators on the several floors, or in special storage containers in the nurses' work rooms.

Artificial refrigeration is produced in one of two ways; (a) by a centrally-located machine employing either ammonia or carbon dioxide as the refrigerant in connection with a brine cooling tank located in close proximity to the machine room, and a system of pumps and piping for distributing the brine to the refrigerators; or (b) my means of small self-contained automatic units. These machines are relatively small in refrigerating capacity, and usually employ as a refrigerant ethyl chloride, methyl chloride, sulphur dioxide, or other refrigerants. They are usually suitable for small refrigerators only, but where two or three small diet kitchen boxes come over one another on several floors, one machine may be installed to advantage for their operation. These machines may be successfully employed in making ice cream and for ice cream serving (not hardening) boxes and for cooling drinking water where a central refrigerating plant is not to be installed. They undoubtedly fill a very decided need in the small institution and in detached locations not easily accessible for brine circulation. Carbon dioxide machines are coming more and more to be used in hospitals, especially if the machine is to be located in the hospital proper, or in a place where escaping ammonia fumes would prove dangerous. If the refrigerating plant can be placed separate with free access to out of doors, the ammonia type machine is entirely satisfactory. In the south, unless condensing water of below 85° temperature is available, carbon dioxide machines cannot be successfully employed. Automatic temperature control is highly essential in all refrigerating plants, more especially for laboratory service. Fig. 5 is a plan of a central refrigerating machine room, with brine tank. This design will be suitable generally for refrigerating plants of from 5 to 20 tons capacity.

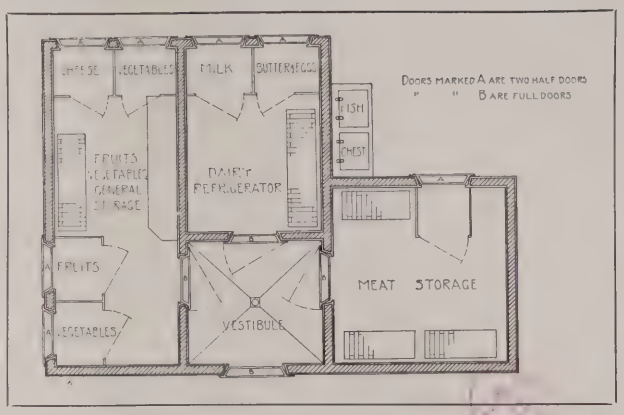

Fig. 6. Built-in Storage Refrigerator plant

Refrigerators for hospital use are of either the portable or the built-in types or a combination of both. The small hospital will probably install portable boxes only, and these may be had in a variety of sizes to meet the demand for storage of food stuffs sufficient for one or two days' use. The "built-in" refrigerator with full-sized doors may be of any required size. In the larger institutions there may be several such boxes opening onto an insulated corridor or vestibule. The vestibule is not refrigerated, but the temperature remains sufficiently low to prevent raising the temperature of the boxes when the doors opening onto the vestibule are opened. The vestibule is also frequently supplied with sink and cutting table and used for meat cutting. Such refrigerators are mainly used for storage and frequently have a capacity for a week's supply.

The main vegetable storage room is usually located in the basement. In the smaller hospitals such rooms are not as a rule supplied with refrigeration. In the larger hospitals, however, such rooms are usually kept at below 60°. Service boxes, usually of the portable type, are installed in the main and diet kitchens, the pantry, bakery, dairy and the laboratories. Frequently, however, the storage refrigerators, if located conveniently to the main kitchen, may be divided in such a way as to povide one or more "reach-in" compartments accessible from the outside. Where this is done, a day's supply of food is usually placed on the shelves of these compartments from inside of the main boxes. This arrangement obviates the installation of a number of portable service boxes, and it also obviates carrying food from the storage refrigerators to separately located service boxes through a hot kitchen.

The walls of refrigerators are insulated according to the service required. The built-in boxes usually have floors 6 inches thick of natural cork laid in hot

pitch on a concrete floor or base. The walls and ceilings are usually 4 inches thick, but in some locations or where temperatures below 25° are to be maintained, they may be 6 inches thick. Fig. 6 is a plan of a built-in storage refrigerator large enough for a 200-bed hospital. Note the two-door (upper and lower) service boxes for dairy products, cheese, fruits, meats, etc., and the ice-cooled fish chest. This refrigerator was built in the main kitchen of a prominent eastern hospital of 300-bed size.

Portable refrigerators are insulated with natural cork or equivalent insulating material, waterproof sheathing paper, and wood or metal. The thickness of the insulation should be at least 2 inches in the smallest boxes and 3 or 4 inches in the larger sizes. The inside lining may be tile, white glass, baked enameled iron, one-piece porcelain or monel metal. The outside surfaces may be wood or baked enameled iron with refrigerator type doors and heavy bronze hardware. Refrigerator shelving may be made of galvanized steel sheets, heavy galvanized wire netting, monel metal, or glass. Fish chests use crushed ice in which the fish are packed. The box and cover linings are usually of galvanized steel or monel metal.

The cooling of refrigerators for hospital use is often done by the circulation of calcium chloride brine from the refrigerated brine tank located near the compressor through steel pipes to the various locations. A direct expansion system is not suitable for hospital use. The brine is circulated by means of pumps, and the pipe circuits are continuous from the brine tank to the refrigerators and back again to the tank. The brine circulation pipes should be cork insulated, of "brine thickness" or heavier if the pipes pass through especially hot rooms or have to carry brine at unusually low temperatures. The cooling pipes within the refrigerators are called "bunker coils." These may be supported from the ceiling if the height is at least 10 feet, 6 inches; otherwise from the side walls. The overhead arrangement is considered the best, as it does not take up desirable space for shelving and food storage along the walls. In either case, pans must be placed under the coils to catch the water while the coils are being defrosted. These pans have to be drained to the general drain from the refrigerator. Portable boxes should always be set on a concrete or tile base about 3 inches above the finished floor, with a sanitary cove. The required amount of ice for the hospital will be made in the brine tank near the compressor. Ice cans are made in sizes to hold from 25 up to 300 pounds. The 50-pound size is convenient for hospitals. Near where the ice is made, a motor-driven crusher should be installed, and ice in that form stored nearby; from there it is carried to the work rooms.

Fire Prevention

Prevention of fire in hospitals is essentially a matter of building design, construction and equipment. The maximum degree of safety is attained by the use of fire-resisting materials and the installation of an automatic sprinkler system. Actual data show that a hospital burns every day somewhere in the United States; that three institutions or asylums for the unfortunate are burned or badly damaged by fire every week. In addition to complete destruction, out of every 16 institutions in the country, one suffers a serious fire every year, and there are upward of 10,000 such institutions in the country, making from 600 to 700 hospitals that suffer in some measure from fire each year. Aside from monetary losses running into the millions, consider if one will, the sick, feeble and helpless patients, and give careful consideration to the type of building construction and equipment for which the architect assumes a considerable measure of responsibility. Statutes and building laws establish building requirements in many cases, especially in the larger communities, but nevertheless the same care should be exercised even wherever greater freedom of design is permitted. Thoughtful hospital authorities will reject wood construction in other than one-story buildings. In multistoried buildings fireproof construction becomes an absolute necessity. Boiler rooms should be isolated by fire walls, ceilings and doors from other parts of the building, and similar construction should extend to rooms in which chemicals, paints, oils, and X-ray films are to be stored. Such rooms should be amply ventilated and shut off from other rooms by fire doors.

The automatic sprinkler is probably the best safety device for putting out fires, and its use is constantly urged by fire authorities. It is also required by statute in many cities. Standpipes and fire hose are of questionable value in some cases, inasmuch as the heavy equipment cannot be readily handled by nurses. Fire extinguishers placed at stragetic points are valuable in putting out fires before they attain dangerous proportions, and to hold fires in check until the arrival of the regular fire-fighting force. If for any reason second class construction be employed, then a sprinkler system assumes greater importance in affording adequate protection from fire.

QUIET FOR HOSPITALS

BY
CLIFFORD M. SWAN

DESPITE all that has been said and written concerning the subject of hospital quieting during the past few years, there still seems to be a large lack of appreciation of the importance of this subject. This may be due in part to the reluctance or inability of trustees and building committees to increase expense, but since the most elementary and inexpensive precautions are so often overlooked, it would appear that the explanation is to be sought elsewhere. Certainly, if doctors and superintendents insist on having anything they consider vital to a hospital's needs, they are likely to get it; since the element of sound prevention is so frequently neglected, it seems probable that the hospital staff becomes so accustomed to its surroundings as not to realize and stress the problem. To the average layman, however, even when strong and healthy, the sounds, sights and odors of a hospital are disquieting if not actually terrifying. How much more is this the case when he is a patient,—weak, sick and worried! If a doctor would appreciate only a small fraction of the suffering caused to a fevered or apprehensive mind by the sounds which carry through a hospital, he would be very prompt in demanding action to eliminate the noise problem. What is more essential to recovery of health than relaxation of nerves and repose of mind? Quiet surroundings and freedom from irritating or exciting noises are of primary importance. To produce such conditions should be a matter of prime consideration for all hospital architects, consultants and superintendents.

Disturbing sounds originate in a number of sources. They may come from outside the building, as from passing street traffic, factory whistles or shouts of children. Again, and with more annoyance, they may come from within, as in the rattle of dishes, banging of doors, groans of patients, cries of infants, or conversation in corridors. To be sure, quiet zones are established in many cities in streets surrounding hospitals, but such regulations are largely ineffective, and noises may and do come also from areas beyond the zones. Sometimes the hospital is not careful about traffic within its own grounds. A friend once told the writer of lying awake night after night in a hospital listening to automobiles and ambulances driving up to the door several stories below his window, imagining in his fever-stricken brain that they were carrying away the bodies of patients who had died during the day! Did that aid in his recovery? Even today that man has an abiding horror of hospitals.

As far as possible, the hospital should be designed and administered so as to keep seriously ill persons at the greatest distance from external sounds. Equally important is it to keep the windows closed, using double panes of quarter-inch plate glass if necessary, and supplying fresh air by forced ventilation. Sounds generated within the building should be less difficult to control, provided the wish to do so exists. It is, of course, axiomatic that all preventable noises should be eliminated at their sources. There must necessarily remain, however, a large and varied assortment, of sounds which are inherent in the operation of such an institution. These must be prevented from reaching the patients.

There are four factors to be considered in such a process, and they should be studied carefully while the building is still in the design stages, and adequate provision for them should be made in the specifications. These four items are: prevention of magnification due to the reverberation in the room where the sound is produced; the stopping of transmission of such sound through the floors, walls and structural fabric of the building; elimination of its travel through open corridors; and, finally, the counteracting of its possible amplification by the reverberation in those rooms or wards which it ultimately reaches. The second of these is a problem in wave conduction and transmission through the materials in the structure of the building. The other three come under cases of sound reflection, and consequently must be studied with relation to the materials and finish of exposed surfaces which the sound strikes.

Let us first consider the transmitted sound. This may be carried along structural members such as columns and girders, or along conduits, steam, water and soil pipes, or through ventilating ducts; or it may pass upward or downward through ceilings or floors, or laterally through wall partitions. If the source is the hum of a motor or fan, the pounding of a pump or compressor, the click of circuit-breakers of elevators, or similar noises, the first thing is to insulate these machines as fully as possible from the supporting structure. This is usually accomplished by bolting the machine to a heavy concrete bed set on an isolating layer of cork sheets. There are also patented systems which have been used with good effect. The insulation of these foundations is of the utmost importance. Perhaps there is nothing so annoying in the small hours of the morning, when all else is still, as to hear the distant monotonous and relentless throb of a pump or similar machine.

The next step is to prevent the sound waves, traveling through the air and impinging on the walls, floor or ceiling, from transmitting their energy through these surfaces or along pipes which may pass through the rooms. This means the construction of soundproof floors and walls, which may be done more or less successfully by various meth-

Sound Absorbing Ceiling Quiets the Corridor

ods, too complicated to describe here. It is well to seek expert advice with relation to the best method to meet local conditions. Pipes should be insulated by wrapping them in soundproof covering wherever there is danger of communication through them. A great deal of sound will pass through a narrow opening, so it is essential that cracks around doors shall be sealed by rabbeted and felted jambs or by weather strips. Doors should be flush and solid, and be kept closed.

Having taken every precaution to prevent the conduction and transmission of sound through the structural elements of the building, the next thing is to take care of reflected sound. In any enclosed space bounded by hard reflecting surfaces, such as concrete, hard plaster, terrazzo, glazed tile and the like, a sound once created will be reflected back and forth several hundred times before its energy is so far absorbed as to make it inaudible. This process takes an appreciable interval of time. If other sounds are generated during that time, they add their energy to the first and to one another, producing an accumulation of energy which causes an increase in the loudness of the sound. Not only this, but if any of this sound penetrates into another room which is itself reverberant, the process is there repeated. This means that the reverberation must be diminished not only in rooms where noise originates, but also in all other rooms where quiet is desired, even if no noise is produced directly in them. Furthermore, the same process of reflecting causes sound to travel readily along corridors and through elevator and dumbwaiter shafts to all parts of the building. Such channels of communication act much like large speaking tubes.

The remedy in all of these cases is to be found in the reduction of the reflecting power of a portion of the surfaces, except perhaps in shafts, where it is better to prevent the egress of sound by means of soundproof doors. Whatever is used to absorb the sound, and thus reduce the amount of reflection, it must be applied as a surface layer exposed to the sound waves, and must be of sufficient thickness to be effective. Such materials run from one half inch to one inch or even more in thickness. Furthermore, the treatment must look well, and it must have a sufficiently high reflection for light so that undue wattage need not be expended in illuminating the room. Some materials have a natural finish which answers the purpose; others require a covering or coating. If this is necessary, even if only a coat of paint is used, there is danger of lessening the efficiency, as the sound waves may not easily penetrate the covering.

All of the surfaces in a reverberant room or corridor do not require absorptive treatment. The noisy condition can be reduced to a practical degree of comfort usually by a marked reduction in the reflection from the ceiling alone, sometimes accompanied, in extreme cases, by a partial treatment of the upper walls. On walls and furred ceilings the absorbing layer should be applied over a brown coat of plaster to insure a level surface. This also will prevent air suction through the treatment and lessen the rapidity of soiling. On ceilings which are not furred, the plaster may be placed directly against the concrete slab between beams. There are many materials on the market which have a high degree of absorption for sound, and which are practical as an interior finish. They vary considerably in efficiency, however, as well as in appearance, sanitary quality and economy of maintenance, so that some are not suitable for hospital use. They fall into three general groups,—fiber boards, felts, and masonry materials such as tile and plaster. In every case the absorption is due to a maze of small intercommunicating pores, nearly uniform in size, permeating the whole structure of the material. If these pores become sealed at the surface, the absorption is very much diminished, especially for sound waves of high pitch, which are present in large number in the voice as well as in most sharp noises. It is essential, therefore, for effective use, that the sound shall have free and unimpeded access to the voids in the material. Here is a difficulty. If the surface must present open pores, it will of necessity collect dirt and germs. How serious the bacterial problem may be is a moot question; it is certain, however, that accumulation of dirt is a real problem, affecting both appearance and light reflection. A material should therefore be selected which can be readily cleaned or redecorated without loss of absorbing power. At the present time, there is no material which ideally meets these conditions, although some are much better than others. Among the fiber boards we find such substances as flax, sugar cane, or mineral-coated excelsior, compressed into rigid sheets or tile, and sometimes perforated to increase the absorption. They usually cannot be washed; cleaning or redecoration must take the

Sound Absorbing Materials Make Kitchens Less Noisy

form of spraying or stippling with a thin paint, except in the case of the perforated material, which may be painted as desired. Felts are made of jute, wool, cattle hair, goats' hair, wood fiber, etc. They were the first materials in the development of the art to be used for the purpose of sound absorption and acoustical correction. They are usually covered by some fabric in order to present an acceptable appearance. If this membrane is unbroken and painted, the pores of the felt are sealed, with the result already described. This limits the desirability of the material as a quieting medium to some extent. If holes are punched in the membrane of sufficient size and number to restore the absorption, the problem of redecoration again becomes difficult, the maintenance cost comparatively high, and the holes give the surface a rather restless appearance. The cleaning problem is much simplified, both for fiber boards and felts, if they are covered with a thin perforated metal sheet. This can be easily painted without refilling the holes, and can be washed or scrubbed without difficulty; but the appearance of the dotted surface is a consideration, as with the perforated cloth.

Tiles and plasters are structural, permanent and fireproof, and give a normal appearance to the surface treated. Their absorption is not quite as great as that of some of the other substances mentioned, but they can be applied over large areas and thus give equal results. The plasters are comparatively low in cost and can be stippled or sprayed with thin paint when soiled. Acoustic tiles, although higher in initial cost, are inexpensive to maintain, can readily be scrubbed with soap and water, and do not need painting. In reaching a decision as to which of all these treatments should be used in any particular case, consideration should be given to the percentage of sound absorption, especially over the upper half of the scale of pitch, to the appearance and light-reflecting qualities, to the possibility of maintaining these, and to the combined cost of such upkeep plus the original cost of installation. Floors should also be given some attention. Marble, concrete or terrazzo simply add to the extent of reverberant surfaces. Linoleum, cork or rubber tile, or composition floorings of similar resilient type, are much more conducive to quiet.

Practically every department in a hospital requires some absorptive treatment. Noises are generated in offices, diet and other kitchens, dishwashing rooms, serving pantries, nurseries, labor and delivery rooms and elsewhere,—noises which should be muffled at the outset by one of the treatments described.

Use of the precautions and corrective measures thus briefly outlined will require some little time and thought in the planning of a new hospital and the letting of contracts, but the labor thus expended will be well worth the trouble in the results which can be attained. If hospital authorities can but realize what a saving in time, health and nervous energy, as well as in actual discomfort and suffering, a little preliminary attention to such details will bring about, our hospitals will not be the maddening sound boxes which many patients think them, and will become more effective places of healing.

LAUNDRY EQUIPMENT FOR HOSPITALS

BY
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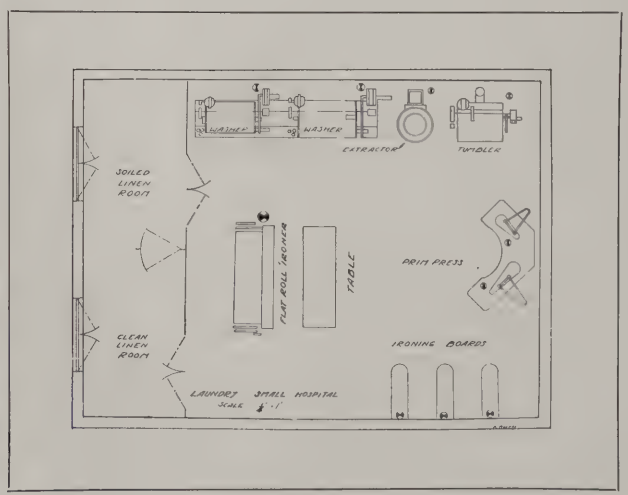
A LAUNDRY as part of a hospital of 50 beds or more is essential for three major reasons. First, the hospital can usually do its laundry more economically than a commercial laundry can afford to do it. Second, there is a material saving of linen in the personal supervision of the way in which the linens are laundered. Third, promptness of service makes it unnecessary to maintain a large reserve supply of linen.

There are two principal considerations of equal importance with reference to the location of the laundry. One is accessibility to prompt hospital service for delivery of soiled linens to the department and the return of clean linens. Chutes of the type that can be cleaned properly are recommended for the soiled linens. In hospitals where one chute cannot service the entire hospital, more may be provided or else auxiliary service in special soiled linen trucks should be maintained. The same trucks should never be used for both soiled linens and clean linens. The second consideration has to do with the supervision of the mechanical equipment by the chief engineer. The laundryman has all he can do to operate the equipment, and it should not be up to him to do the necessary repair work. The latter should be part of the duty of the engineer. Unless the equipment receives constant mechanical supervision and inspection by the chief engineer or his assistant, the equipment may not give the service the hospital's needs demand. Such things as oiling and greasing can be done by the laundryman, but they should be checked by the engineer.

A well planned hospital laundry department should have a minimum of four rooms,—one soiled linen room, one wash room, one clean linen room, and one supply store room. In a hospital that has a school of nursing, it is most desirable, even in one of the smaller hospitals, to have a special clean linen room for personal linens. Care should be given in arranging the units of the department so as to avoid as much cross traffic as possible. Thought should be given to planning so that the operating costs can be kept to the minimum. Many features of economy can be included. In the average small or medium-sized hospital it is possible to utilize each employe's services for more than one particular work. The washman need spend only his mornings in the laundry, while in the afternoon his time can be spent working in some other department. We know that it usually takes four girls to operate the mangle. When the mangle is not running, a sufficient number of hand ironing boards and prim presses should be available to keep these girls busy. At least one third of the shelf space in the clean linen room should be of the locker type so that a reasonable supply of clean reserve linen could be kept ready for an emergency. Attention should be given the size of the supply store room so as to permit the management to take advantage of quantity prices. However, linens in storage should not be kept in the laundry supply store room.

The equipment needed in the laundry is determined by the demands of the hospital. The minimum equipment for first class work,—two washers, one extractor, one mangle, one prim press, three hand ironing boards and one tumbler,—can be made to give efficient service, using the different sizes available, in a small hospital of 50 beds or even in a medium-sized hospital of from 150 to 200 beds. This amount of equipment can be relied upon to turn out from one thousand to four thousand pieces of hospital linens in an average eight-hour day.

A Well Equipped Hospital Laundry



Plan for Laundry of Small Hospital

MODERN HOSPITAL SANITARY INSTALLATIONS

BY
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MEMBER AMERICAN SOCIETY OF SANITARY ENGINEERING

TIME was when a hospital was simply a room or rooms or even a whole building for the gathering of the sick or injured so that continuous care in nursing, and proper diet, dressings and medicines could be regularly administered, but without plumbing equipment other than toilet facilities and a few sinks for a supply of water to be boiled for sterilization.

Hospital operation requires comparatively large quantities of water, for cleanliness is the basis of efficient service, and in order to economize the labor of nursing and housekeeping staffs and save precious time of the medical and surgical personnel, it is very necessary that fixtures to supply water and to remove waste must be well distributed and that the fixtures themselves be adapted to the service, so as to be as far as possible self-cleansing.

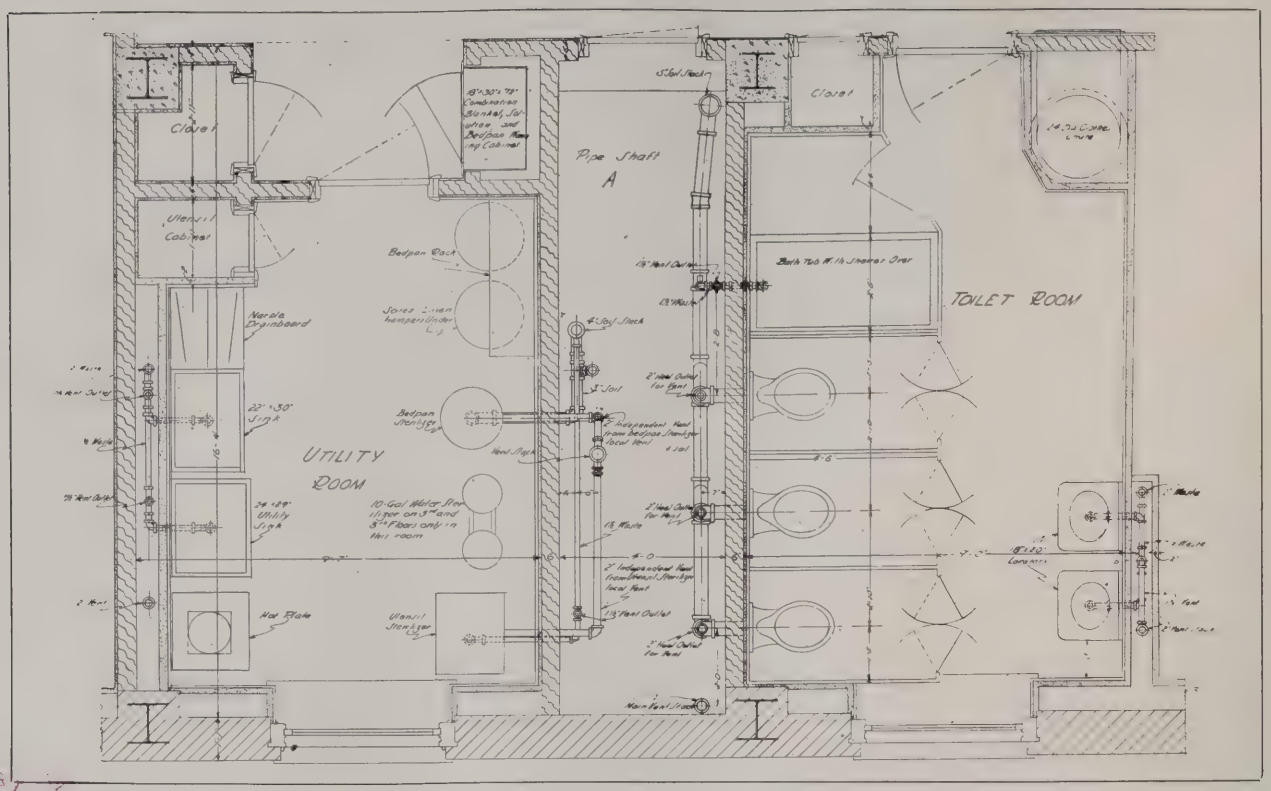
Necessity and Danger. Plumbing has advanced till it may be said that the modern hospital is built around its plumbing. After it is once installed, less attention is paid to the plumbing than to any other part of the plant or structure. The hospital authorities, usually physicians, generally know little of the practical end of sanitation in plumbing, and are likely to explain unexpected relapses and cases of infection as due to any source other than to thoughtless tinkering with the plumbing system. Scores of such cases, previously unexplained, have been definitely traced to defective plumbing,—usually carelessly or ignorantly mutilated plumbing. It can be seen that the hospital's greatest asset,—a comprehensive plumbing system,—can also be its undoing. Post-operative infection is probably in nine cases out of ten traceable to washing the wound with infected water supposed to be sterile, or to the use of contaminated dressings. There is usually no thought given to the sterilizer and the possibility of infection from that source, as it is a mechanical appliance and is not supposed to go wrong. It may have been so connected with sewer pipe and water supply that pollution or infection is not only possible but probable each time certain conditions occur co-incidentally, and in the usual plumbing installation such conditions occur with more frequency than one would expect. Check valves and other mechanical appliances in water and waste lines are no bar to the passage of the minute organisms, and that the natural laws of gravity and siphonage are operative in every plumbing system.

The Source of Trouble. It is customary to provide water supply pipe sizes only sufficiently ample to care for a part of the fixtures drawing at one time; therefore, with a large number of connections on a single riser of many stories, the opening of several faucets on the lower floors creates a pressure reduction above, even extending to a point of pressure (or lack of it) where gravity from the higher levels will overcome it and cause siphonage of the contents of the attached fixtures or appliances if the supply valves be intentionally opened or if the valves are in a leaky condition, or possibly if through carelessness they have not been shut off tightly. This same condition occurs whether the water supply comes from the street pressure or from an overhead tank. If the siphoned fixture happens to be a bed pan sterilizer in a typhoid fever ward, the siphonage of the contents back into the general water supply line of the hospital may occur.

The Remedy. There is no known *positive* remedy or preventive of this condition except the use of a definite "air break" between the water supply and the fixture served. An air break is the delivery of the water supply freely through the air from an opened valve above the fixture, such as the faucet over a kitchen sink. A direct connected pipe is subject to siphonage whenever it is possible, even under unusual conditions, such as obstruction of the waste, for the water level in the appliance to rise as high as the supply connection. Vacuum valves in the water supply line will provide protection as long as they remain in operative condition, but they may get out of order, someone may place something so as to obstruct them, or other conditions may interfere with their action, and while their use might be considered permissible in apartment houses, hotels and other structures where the risk of infection is not great, they should not be used in hospital work.

At the present time most of the plumbing appliances used in hospital equipment are of the closed pattern, with both water supply and waste to sewer having direct pipe connections, each being closed off with a valve. These valves, water-tight when in proper repair, are never gas-tight except when water is in the fixture, and not fully so then, as the standing water at any temperature under 140° will become contaminated through absorbing sewer air. This is a slow, normal contamination and is distinct from the definite infection just described. It is only in the last two or three years that this condition and the necessity for special sewer and water connection in hospital work have been recognized.

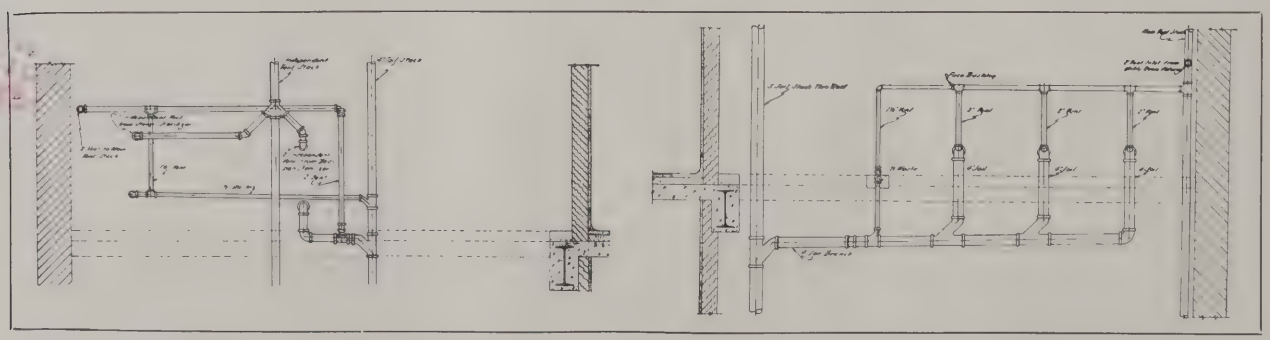
Cross Connections Fatal. One writer claims that nine out of ten present-day hospitals have one or several serious examples of cross connections between water supply and sewage, which directly cause many otherwise unexplainable fatal terminations in medical cases through use of drinking water contaminated in the building and in surgical cases through wound-washing with infected water and dressings. Conservative thought would not



Plan of Utility Room, Toilet Room and Pipe Shaft Showing Plumbing Connections

place the proportion so high, but certain it is that many, many hospitals should have an expert sanitary engineer of unquestioned ability go over their equipment and give it a thorough dye test. While lack of knowledge may in the past have been some excuse for permitting the creation of a condition out of which direct or indirect contamination and infection could arise, there is, in the light of present-day research and information, no excuse for permitting the erection of a new hospital and installing its equipment with sterilizers and other sewer- and water-connected fixtures in such a manner as to make a cross connection even remotely possible. It is reported that one very large hospital project, only recently completed, developed under a dye test eight different types of improper connections with many instances of each, and that the correction of these, before throwing the doors open, cost in the neighborhood of $60,000. This should have been taken care of in the design.

Importance of Pipe Sizes. Design and sizing of the water supply system are second in importance only to the type and design of the fixtures to be used, and much care should be taken in the layout. The exact sizes can be determined only when the size of the structure and the type of service to be provided for are definitely known, but all supply pipes leading to nursing service rooms, generally known as sink rooms, to all sterilizer rooms and to diet kitchens should be full size to care for all openings operating simultaneously without undue pressure drop. To some this might seem to require absurdly large riser lines, but in hospital design it is better to err on the safety side. In tall buildings it is good practice to make the drop line from the tank somewhat smaller and group larger supplies to each floor or to two floors on a pressure-reducing valve; in fact the use of pressure reductions is to be recommended, as it is *volume* that is desirable and not *pressure*. Low pressure and large pipes make for



Section Through Pipe Shaft Showing Utility Room Connections

Section Through Pipe Shaft Showing Toilet Connections

reduction in velocity with consequent elimination of noise from the system, and if the velocity can be kept below 9 or 10 feet per second and if all ends of long runs are protected by elastic disc shock absorbers, the water supply system will be effectively silenced and protected against strains.

Proper Pipe Sizes. In sizing supply lines it is customary to assume the discharge area of all compression valves or faucets as 60 per cent of the cross-sectional area of the tailpiece of the couplings, which is usually a ⅜-inch or ½-inch iron pipe size. The inside area of pipe is not the same as the area of a circle of the same denomination but differs slightly for mechanical reasons, the effective area of a ⅜-inch pipe being .191 square inch instead of .110, and of a ½-inch pipe, .304 square inch instead of .196; the actual diameters being .493 and .622 inch respectively. The reason for assuming 60 per cent of the pipe supply area of a compression valve or faucet is that the disc never lifts more than half the diameter above the seat, and there is a considerable friction component to be added; and it follows then that the effective flow area to be figured for a ⅜-inch compression connection is .12 and .18 for a ½-inch. For a gate valve connection full area must be used. Knowing the total number of outlets, it is a simple matter to add them up and to size the pipes accordingly, as on risers and short runs at low velocities the frictional drop can be practically disregarded. One error frequently made in sizing supply pipes is in using the *nominal* instead of the *actual* diameters and areas, and another is using the old "rule of thumb" that doubling the diameter increases its capacity four times. Doubling the diameter does increase the area four times, but it only doubles the inside circumference, called the "wetted perimeter," and it is the relation between this and the area which determines much of the frictional resistance to flow. Therefore, instead of pipe capacities being to each other as the squares of their diameters, their relation is as the square root of the fifth power, or instead of 1 to 4, it will be about 1 to 5.7, at least in the sizes of pipes we have to deal with in plumbing a building. Adherence to use of these proportions will give ample flow, without undue drop in pressure, and the pipe sizes generally will be much less than as if full areas are taken.

The main supply pipe from which the various risers are taken, whether run around the building in the basement, or around the top story ceiling, or in the clear space under the roof, should be larger than proportional requirements so that it can act as a drum or header, allowing free pressure distribution in each direction. The tank, pump, or street pressure connection to it, however, can be smaller and of just sufficient size to furnish the required supply at times of peak load. The lateral branch to each riser should *grade back* to the drum, each branch should be valved and tagged, and it is also good practice to make these branches one size larger than the riser lines. If supply is from a city main, arrangement should be made for storage of a small supply to tide over possible shut-offs to the neighborhood, or a nearby fire, which might drain the supply by suction. A gate valve and an efficient check valve should be provided on the entering main and three gate valves and a check valve provided on the meter by-pass.

Unless the source of the supply is of unquestioned character, a battery of filters should be installed. The most satisfactory type for hospital use is the gravity sand and quartz filter with a reversible washing arrangement. These filters can be so installed that they can be cut in when needed, and in battery so that any one may be cut out of service for washing or repair without affecting the others.

The hot water supply of a hospital is usually maintained at a higher temperature than for other classes of buildings and as precipitation is more active in such a case, brass pipe will probably be used, preferably U. S. Government Class A pipe with Navy Standard fittings. In high-temperature hot water service there is much strain on joints, owing to extreme expansion and contraction, and ordinary brass fittings are likely to deform and strip threads. Navy Standard fittings are designed to prevent this and have been found entirely satisfactory in high grade work. In passing, it is interesting to know that cast iron is not subject to the same limitations as wrought iron or steel in water supply work, and there are many instances where, to save expense, uncoated cast iron fittings have been used with brass pipe and are apparently satisfactory.

Cold Water Supply. Need for the best non-corrosive pipe for cold water supply is not generally so pronounced, although deemed necessary in certain sections; but it is well to consider the desirability of its use for all riser lines and concealed piping, at least. Genuine galvanized wrought iron pipe may well be used for exposed main piping and headers, as it can readily he repaired or replaced when the need arises, and in the larger pipes the difference in cost would seem to justify such construction. Any pipe added to the water sterilizer outlet must be glass, glass lined, or block tin.

Soil and Waste. Too much care cannot be given to the soil, waste and sewer installation. Every fixture trap should be self-cleansing, all changes in direction should be made with what are termed "long-turn fittings," and the sizes should be as small as possible consistent with fixture waste requirements so as to be self-scouring. In the absence of any local plumbing code, the work should be done in accordance with the accepted requirements of the so-called "Hoover Code." A full vented plumbing system is desirable in any building, but in a hospital structure it is a necessity, and even added relief vents may well be used. The sewer and house drain generally will, of course, be of extra heavy cast iron soil pipe with lead calked joints, but there is some leeway in the selection of the kind of pipe for the

stacks and branches. The use of standard weight galvanized steel or wrought iron pipe has been quite general, since it possesses advantages of fewer joints, better finish and less space occupied by pipes in walls, chases and bulkheads; but the almost universal use of concrete as a floor slab and skin wall material has brought into question its effective life in the building, due to possible corrosion from contact with that material. Acids are also used in hospital work in the laboratory and to a limited extent in the nursing service rooms and elsewhere, and as steel pipe is very susceptible to injury by certain acids, interior pipe corrosion may ensue. Extra heavy cast iron soil pipe is also subject to corrosion, but in a more limited way owing to its granular structure. In some cities it is a requirement that all sewage from a hospital unit or group must pass through a disinfecting chamber, and it is a question as to whether it should not be done whether required or not. Such a chamber can be easily provided in the shape of a concrete flush tank of suitable capacity, arranged to receive and retain the sewage the while an automatic feeder applies the proper solution at intervals, and then periodically flushing it out into the sewers by means of an automatic sewage siphon.

Fixtures. In addition to the usual toilet and bath fixtures of a hospital, which are usually of the standard types used elsewhere, there are many special fixtures for the surgeons' or nurses' special requirements and several used in special treatments. Equipment for both main and diet kitchens, and laundry equipment too, are what might be specified in hotel work, except that the laundry will be equipped with disinfector, and there should be additional and positive dish sterilizers in the kitchen and pantry instead of relying on the hot water in a mechanical dish washer. The usual laundry sterilizer equipment is of the rectangular type.

Sterilizers. Not only are steam pressure sterilizers used for dressings, but additional "autoclaves," as they are called, are used for utensils and instruments. They may be operated by gas or electricity, but steam is preferable in all cases where a high-pressure boiler system is in service in the building at all hours of the day and night. If this dependable supply of pressure steam from the boiler is not available, the use of electricity is usual. Autoclaves for dressings are either part of the main battery in the sterilizing room between the operating rooms, or, in larger hospitals, in the nurses' work rooms. Instrument and utensil sterilizers may be of either the open boiling type or of the pressure type. The most advanced pressure steam sterilizers are of the concealed wall type. The number, size, type and location of sterilizers are important to the architect in planning for their connections.

Water sterilizers in the sterilizing room will vary in size according to the demands and size of the hospital. A pair of 15-gallon water sterilizers with a 1-gallon still is satisfactory for hospitals of up to 15 or 20 beds. Thirty-five or 50-gallon sterilizers with a 4-quart still are suitable for hospitals of from 50 to 100 beds. Utility rooms should have a small portable electric instrument sterilizer for treatment work. They should also be provided with apparatus for emptying and cleansing bed pans. The open hopper sink for bed pans is being discarded in favor of the bed pan washer and sterilizer. With all sterilizing apparatus great care must be taken to avoid cross connections which may cause polution of the water supply or contamination that will cause post-operative infections. Water supply lines must be so arranged that water from them cannot siphon back into the water supply in case the pressure is taken off while the supply valve is open or leaky. The water supply to sterilizers should be by gravity from a special tank with an elevated ball cock arranged to have the supply to it discharge above the water line so that siphonage is impossible.

Sinks and Lavatories. In addition to sterilizing apparatus, each nursing service room should be provided with a slop sink with full 3-inch trap way, a service sink, and a pack sink. The service sink is for handling icebags, hot water bags, utensils and similar work, and the pack sink is for preparation of hot and cold wet packs for patients. A 22-inch x 36-inch sink 10 or 12 inches deep will answer for either of them, and quite frequently a double fixture is used. It is also wise to provide a special nurses' wash-up lavatory with the water supply control through a mixing box operated by elbows, knees or by foot pedals. Such a fixture enables the nurse to thoroughly cleanse and sterilize her hands without soiling them again by touching the faucets to shut the water off, and in making ready to handle and dress open wounds even the remote possibility of infection from the valve handles must be avoided.

Other special fixtures are the babies' bath in the nursery service room, a plaster sink with a special plaster-intercepting trap in the cast room, and "straddle stands" in venereal treatment rooms. The water supply to these latter fixtures must always be taken from a special gravity tank for obvious reasons, and surgeons' wash-up lavatories should also be provided in the rooms. Post-mortem and morgue tables are sometimes provided with a sewer connection, but it is considered better practice to discharge them over a trapped and vented floor drain. Floor drains may also be installed in nursing service rooms and where floors are expected to be washed down with a hose, and all floor drains should be of the flushing-rim, flush-valve-operated type. A sewer-connected floor drain or other sewer-connected fixture should never be put in an operating room on account of the possibility, however remote, of back pressure's blowing the seal during an operation.

Some hospitals maintain hydrotherapeutic sections for the giving of percussion treatments, Scotch douches, and kidney and liver spray baths. Such equipment, consisting of control table, shower, needle and sitz baths, and the continuous-flow baths so much used in mental cases, may be had in many forms.

BUSINESS RELATIONS WITH HOSPITAL BUILDING COMMITTEES

BY
C. STANLEY TAYLOR

THE development of a hospital project brings the architect into contact with a hydra-headed client,—many heads, each thinking independently and each demanding consideration of its own problems on the part of the architect. There is no single responsible client in institutional building problems, and the architect who engages in this form of work soon finds that he must develop in his dealings with this composite type of client a technique somewhat different from what he customarily employs in ordinary domestic work or in the development of an investment or business structure which is dominated by a single individual whose authority is complete. This body with many heads must not be confused with the hydra-headed monster of mythology, for it is composed of a group of very normal human beings. The complexity of the architect's business relations may be somewhat increased, and he may find it more difficult to establish a division of responsibility.

We cannot speak of a typical hospital building committee with any more precision than we can speak of a typical man, but nevertheless, it is possible to broadly define the composition of the usual or normal hospital building committee. Its membership varies in size from three to five hand-picked members (the ideal committee) to a conglomerate body of from 50 to 100 individuals who have been organized rather heedlessly under the misconception that the greater the number the more funds for the project and the more ideas from which to derive a perfect hospital structure. Usually the membership includes one or more laymen selected for their business acumen and knowledge of finance; a small group of public spirited citizens, who are included because of their willingness to devote time to any public welfare enterprise, or who may be important for local social or political reasons; one or more members of the medical staff; and usually the hospital superintendent or some representative from the executive staff. In addition, the hospital committee may have a hospital consultant as its technical adviser. Out of this group there usually evolves a small active sub-committee that does most of the work, and this sub-committee almost inevitably will include a member of the medical staff, a member of the executive staff, and a business representative of the board of governors or directors. This latter individual may be put on the active committee to control finances,—which is highly desirable.

Unless a hospital project has its genesis in an unexpected endowment, the first problem of the building committee is to establish a budget covering the necessary construction and development expenses. The budget must be predicated on a knowledge of what the hospital requirements of the community may be, and this involves a determination of the type of hospital building, its size, layout, and the nature of its accommodations and equipment. Frequently the architect is not engaged in time to render much needed advice during this preliminary stage, with the result that an inadequate budget is often established, or else the committee ultimately raises funds for a building which is not well adapted to the actual requirements. This situation usually necessitates replanning and re-budgeting the project in a manner which may be quite contrary to the contributors' expectations. The next step involves raising funds for the hospital, and this is of utmost importance to the architect, since once the funds are raised it is exceedingly difficult to get additional money to meet unexpected contingencies or an over-run on building costs. Secondly, if the financial campaign is unsuccessful, the entire budget and the preliminary plans must be revamped to accord with the money available.

When financial matters are settled, the building committee turns more definitely to the solution of many technical problems involved in the actual design of the desired structure, and at this stage the services of the architect and the hospital consultant are fully appreciated and are drawn upon heavily. The committee has an important problem within its own body to correlate and adjust the frequently conflicting ideas of its several members,—a problem of no mean importance, in which the experienced architect must display extraordinary tact, a sound knowledge of hospital design and construction, and a measure of firmness which is founded upon confidence in his own competence. Subsequently, out of this mass of problems there emerges a definite building plan and construction program, and the committee faces its final problems of contracting for the work and supervising construction. At this stage the intelligent building committee desires relief from the responsibility of construction supervision, but, unfortunately, the work then being in tangible form, the committee usually undertakes personal supervision to a degree which amounts to actual interference with the architect's proper work.

Upon the architect and his colleague, the hospital consultant, there devolves the critically important problem of correlating the interests of the building committee. By keeping the various points of view constantly in mind and conforming in all of his contacts to the points of view of the individual members with whom he is dealing for the moment, the architect can make substantial progress and avoid the difficulties which usually arise when the professional adviser "takes sides" with one or another element in a composite body of this sort. This thought applies to the procurement of architectural commissions during contacts or solicitations with the various members of the newly formed building committee, as well as to dealings after the commission has been secured.

Before important decisions are reached, it is essential that the building committee function as a unit and become a homogeneous body working harmoniously toward a definite objective. No contracts can be signed and no permanent decisions reached if five or six minds are working in as many different directions. Theoretically, perhaps, the architect is not the chairman of the building committee and, therefore, does not necessarily face the problem of welding the committee into a smoothly working unit, but his technical training and his knowledge of the problem to be encountered logically equip him to assist in this work. One effective method of accomplishing this result is to frankly make the building committee itself appreciate its normal divisions of interest and to openly deal with certain members on costs; with other members on plan and equipment from the medical point of view; and with the rest of the committee on the practical problems which relate to operation and maintenance. The architect, by thus dividing the committee, must himself assume the responsibility for adjusting conflicting requirements, but he is equipped to do this work better than anyone else, unless it be the hospital consultant.

To digress for a moment, it may be worth while to consider the architect's relation with a hospital consultant employed directly by the committee. There are a number of architectural offices which have handled hospital projects in sufficient number to have become thoroughly qualified to serve a hospital building committee without the aid of a specialist as consultant. Such an organization has at least one individual on the staff who is conversant with all types of hospital food service systems, with the latest advances in medical and surgical equipment, and with the detailed problems of hospital operation and management. Such individuals are rare, and usually sooner or later they branch out as hospital consultants on their own account, for it must be recognized that hospital planning is a complex science that has reached the state of development where it requires intensive study and intimate knowledge of the almost daily developments in hospital practice. Lacking such an individual in the architect's organization, the best interests of both the client and the architect are served by recommending the employment of a qualified individual to serve in a consulting capacity. The consultant should be chosen only with the architect's approval and coöperation. It is the function of a hospital consultant to know the merits and demerits of every alternative arrangement and of every item of equipment down to the last detail of hardware. The architect working with a competent consultant saves himself a great deal of expense and time in developing an efficient plan and proper specifications, and he in no wise impairs his professional standing by recommending the employment of a specialist.

Returning again to the building committee, there are several matters to which the architect should pay particular attention if difficulties are to be avoided and a pleasant relationship maintained. The first principle of good management in building projects is to arrive at a settlement of every conceivable problem before the client is committed to an actual construction contract. The architect, therefore, should prepare his preliminary drawings with exceptional care and carry them to considerable detail in their final stages before asking approval preparatory to starting working drawings and specifications. Similarly, the preliminary drawings should be accompanied by outline specifications in which every item of material is brought up for discussion with the building commitee and a written record retained of its approvals and disapprovals of the architect's recommendations. The preliminary studies and specifications should finally be accompanied by estimates prepared by competent builders, estimates which are likewise submitted to the committee for study in order that every precaution may be taken to prevent an over-run in construction costs. A fourth detail of almost equal importance is to insist that the building committee submit the preliminary plans to a competent insurance broker or direct to an insurance rating bureau for the purpose of obtaining recommendations which may reduce insurance rates.

After the working drawings and final specifications are completed, it is advisable to submit these also to the building committee, and to make a careful check of the final documents with the approved preliminary drawings and specifications in order to demonstrate that the architect has not deviated from his instructions or exceeded his authority in a manner which might subsequently result in increased cost which the committee has not had an opportunity to approve. These precautions will simplify the always troublesome problem of opening bids and completing construction contracts. So long as the building committee is completely informed of every step of the work being done by the architect and is required to express approval of his actions wherever they relate to materials or costs, there can be no loss of confidence in the architect's capacity or integrity. If the committee is left ignorant of many such details, and if the cost subsequently exceeds its expectations, it inevitably blames the architect for extravagance or incompetence, regardless of the care he has exercised to protect the committee's interests.

In the final stages of actual construction work, the architect should exercise equal care to obtain the written approval of the building committee for every change in the plans or specifications which affects the contract price by either an increase or a decrease in cost. This is necessary for the protection of the architect and the contractor, as well as to protect the committee from committing itself to an expenditure for which there are no funds. It is equally important to impress upon the committee that it has no right or authority to deal directly with the contractor or to make criticisms or changes except through the architect. A clean-cut division of responsibilities between the committee, the architect, the consultant and builder, will simplify the work of all.

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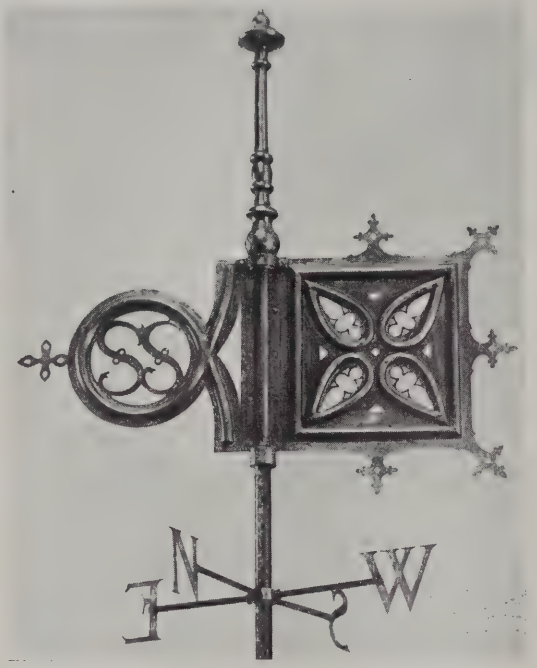

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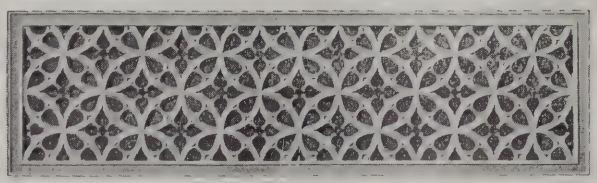

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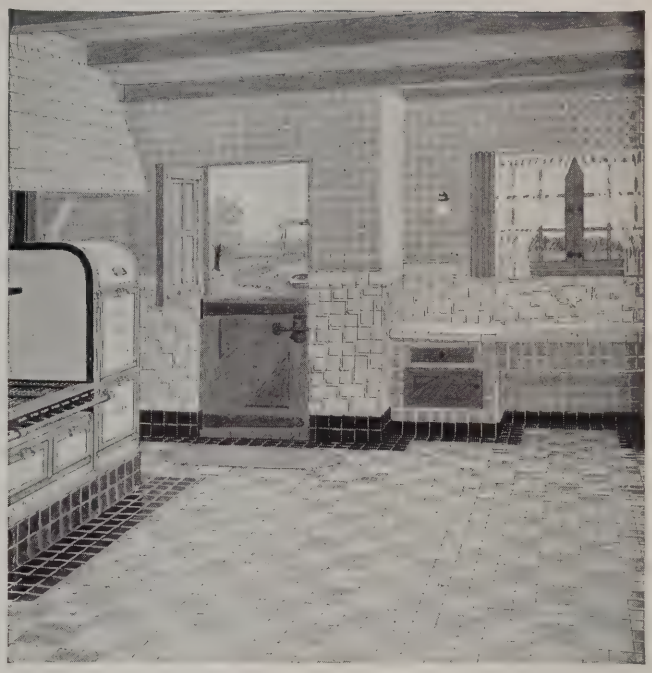

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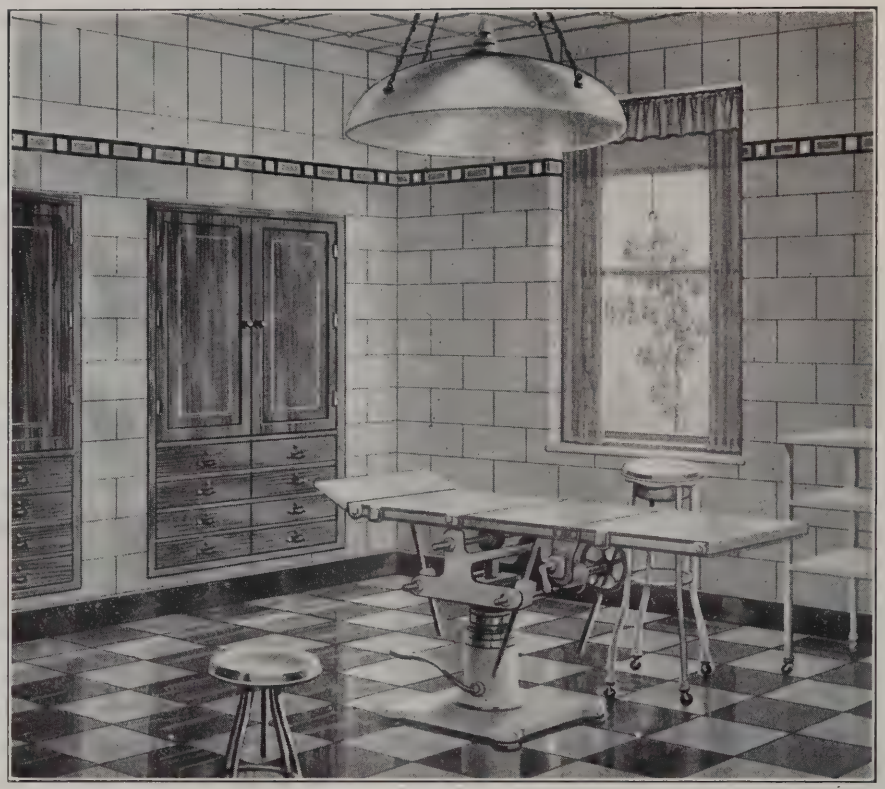

Hospital Installations

Cook County Hospital, Chicago. Illinois
C. E. Hall, Architect. Vitrolite used in Operating Rooms.

Grant Hospital, Chicago, Illinois
Schmidt, Garden & Erickson, Architects.

St. Mary's Hospital, Gary, Indiana
H. J. Gaul, Architect.

Ashland State Hospital, Ashland, Pa.
Vitrolite used in Reception, Operating Room and Supt. Office.

Germantown Hospital, Philadelphia, Pa.
Arthur H. Brockie, Architect. Vitrolite used in Operating Room.

Bryn Mawr Hospital, Bryn Mawr, Pa.
Zantzinger, Borie & Medary, Architects.

Jersey City Hospital, Jersey City, N. J.
John Rowland, Architect. Vitrolite used in Operating and Sterilizing Rooms.

Industrial Home for Blind, Brooklyn, N. Y.
Tillion & Tillion, Architects. Vitrolite used in Toilet Room Partitions.

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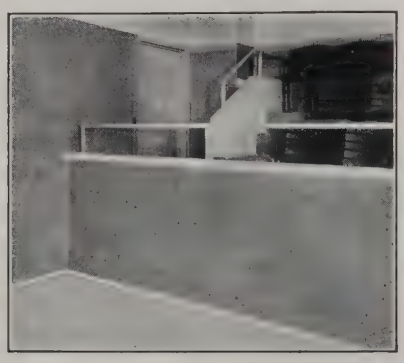

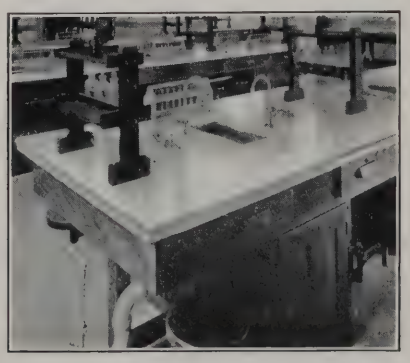

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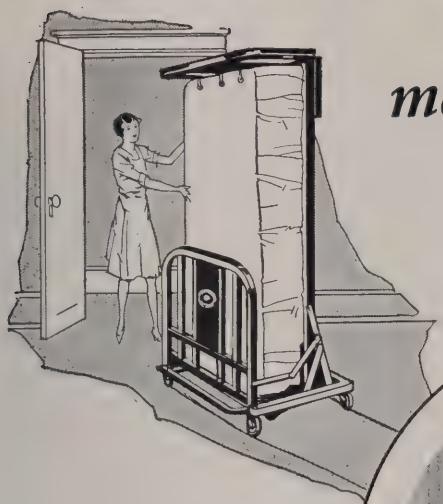

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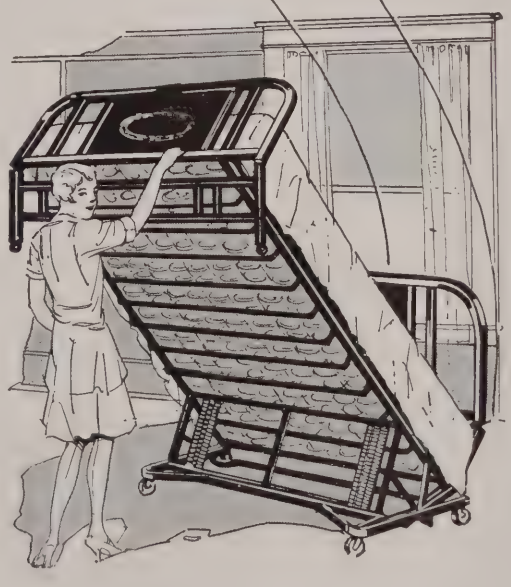

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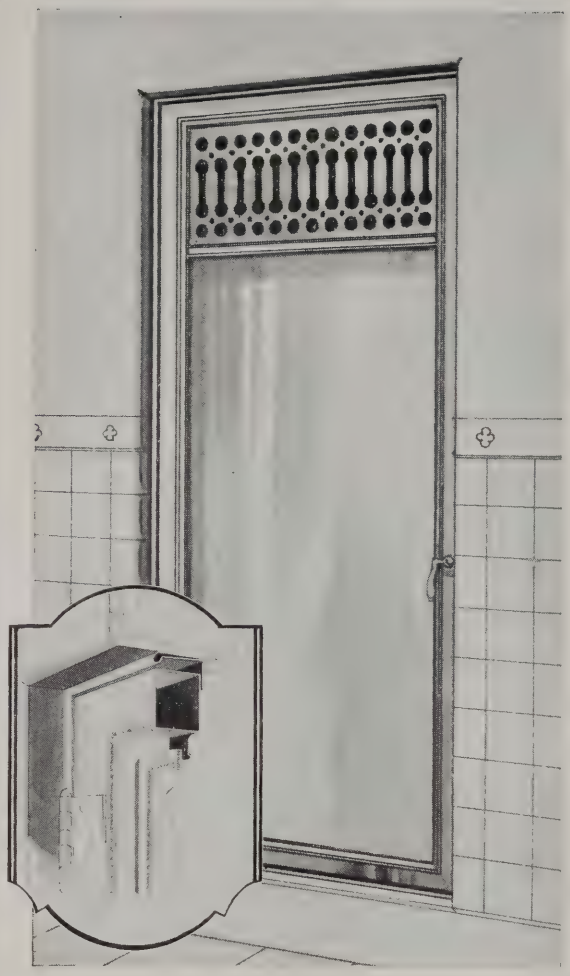

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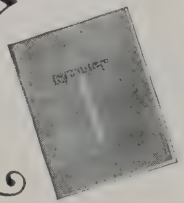

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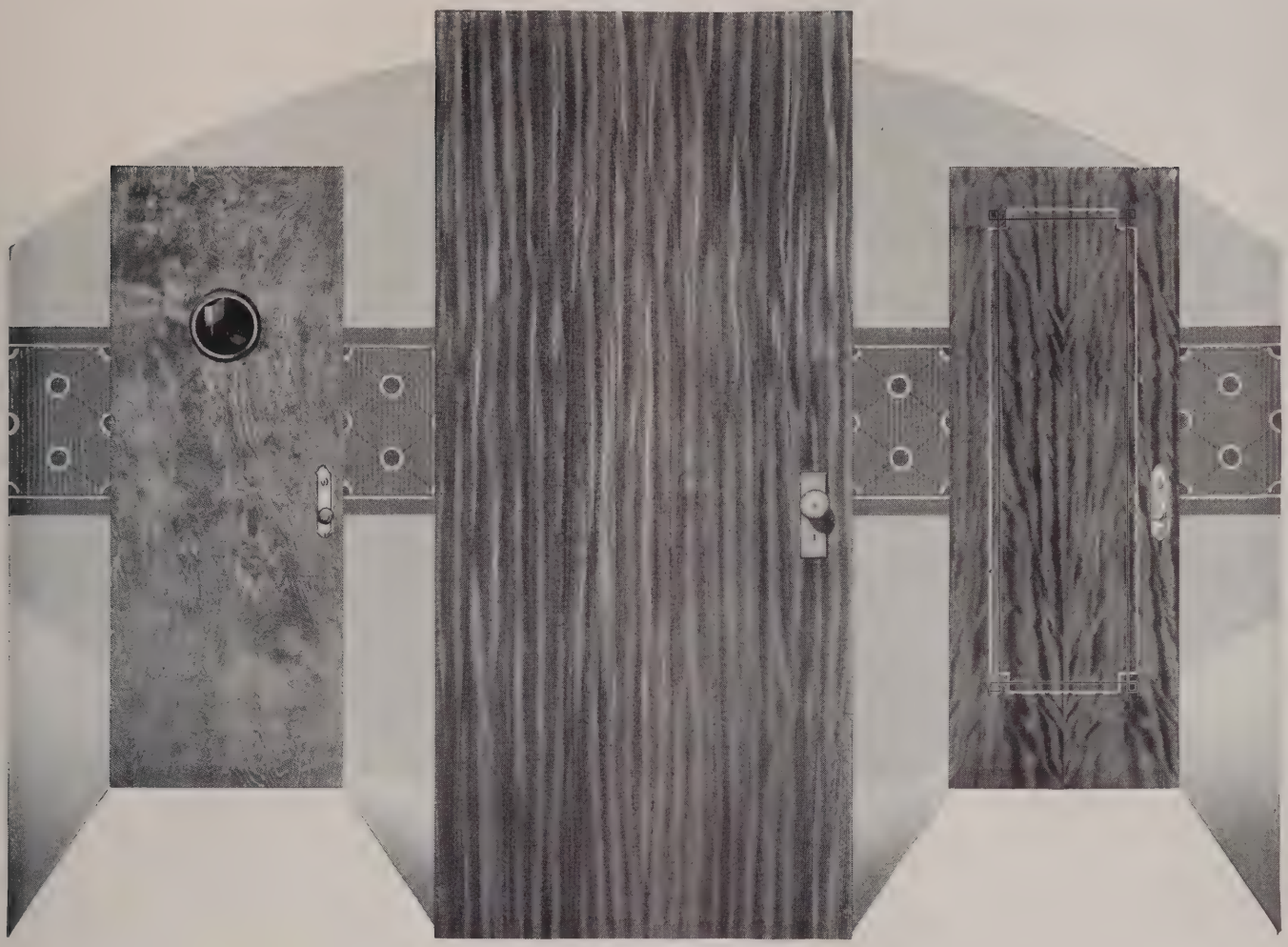

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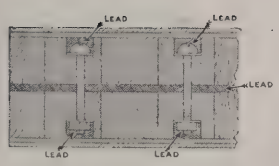

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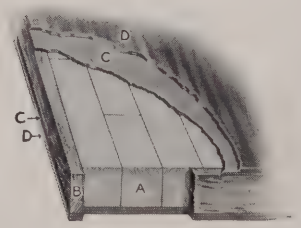

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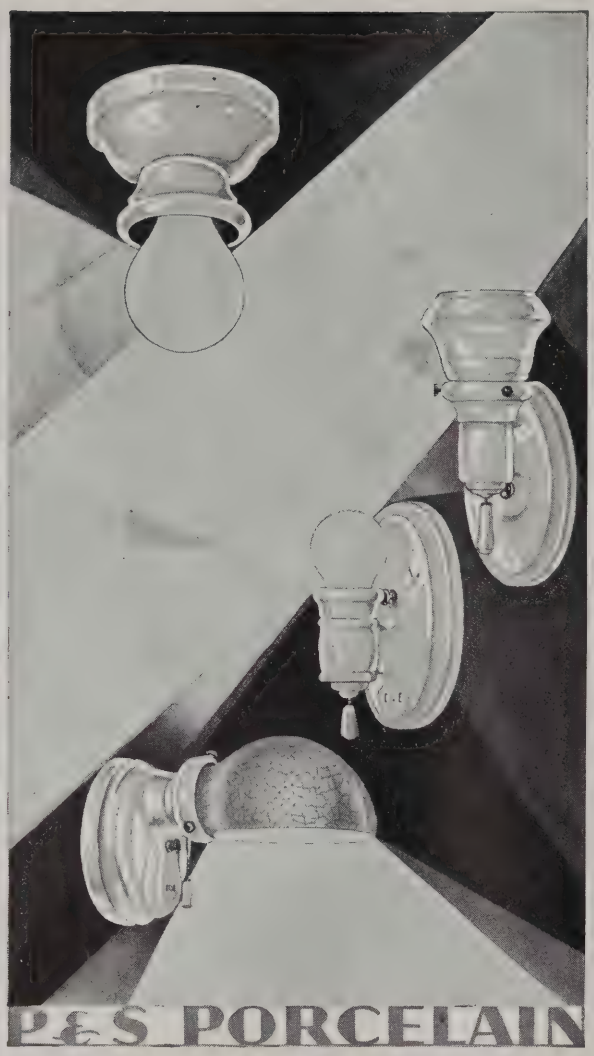

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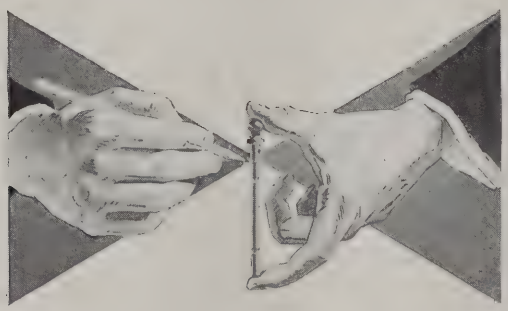

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"ASK YOUR BUILDING MATERIAL DEALER....."

Selected List of Manufacturers' Publications

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge, unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 383 Madison Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

R. Guastavino Co., 40 Court St., Boston.
Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

AIR FILTERS

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

BASEMENT WINDOWS

Genfire Steel Company, Youngstown, Ohio.
Architectural Details. Booklet, 28 pp., 8½ x 11 ins. Details on steel windows. A. I. A. File No. 16E.

BATHROOM FITTINGS

A. P. W. Paper Co., Albany, N. Y.
Onliwon for Fine Buildings. Folder, 8 pp., 3¼ x 6 ins. Illustrated. Deals with toilet paper fittings of metal and porcelain.

Architects' File Card. 8½ x 11 ins. Illustrated. Filing card on toilet paper and paper towel cabinets.

A Towel Built for Its Job. Booklet, 8 pp., 4¼ x 9⅝ ins. Illustrated. Paper Towel System and Cabinets.

Cabinets and Fixtures. Booklet, 31 pp., 5¾ x 4¾ ins. Illustrated. Catalog and price list of fixtures and cabinets.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pages, size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.

Industrial Buildings and Housing. Bound Volume, 112 pp. 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00, postpaid (formerly $2.00).

Common Brick Mfrs. Assn. of America, 2134 Guarantee Title Bldg., Cleveland.
Brick; How to Build and Estimate. Brochure, 96 pp., 8½ x 11 ins. Illustrated. Complete data on use of brick.

The Heart of the Home. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.

Skintled Brickwork. Brochure, 15 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.

Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.

Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook, 8½ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Missouri Portland Cement Company, St. Louis, Kansas City, Memphis.
Twenty-four Hour Cement. Booklet, 15 pp., 8½ x 11 ins. Illustrated. Data on a cement which makes a quick-drying concrete.

Precautions for Concrete Paving Construction in Cold Weather. Folder, 4 pp. 6 x 9 ins.

Design and Control of Concrete Mixtures. Booklet, 32 pp. 8½ x 11 ins. Illustrated.

Concrete Paving Construction in Hot Weather. Booklet. 11 pp. 6 x 9 ins. Illustrated.

Pennsylvania-Dixie Cement Corp'n, 131 East 46th St., New York.
Celluloid Computing Scale for Concrete and Lumber, 4⅝ x 2½ ins. Useful for securing accurate computations of aggregates and cement; also for measuring lumber of different sizes.

Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

CEMENT—Continued

Town and Country Houses of Concrete Masonry. Booklet, 19 pp., 8½ x 11 ins. Illustrated.

Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Design and Control of Concrete Mixtures. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

Concrete in Architecture. Bound Volume. 60 pp., 8½ x 11 ins., Illustrated. An excellent work, giving views of exteriors and interiors.

CONCRETE BUILDING MATERIALS

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 p., 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure. 16 pp. 8½ x 11 ins. Illustrated. Data on coloring for floors.

Dychrome. Concrete Surface Hardener in Colors. Folder. 4 pp. 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 ins. 32 pp. Illustrated. A treatise on fireproof floor construction.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet. 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plaster-Sava and Longspan lath channels, etc.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.
Pressure Relieving Joint for Buildings of stone, terra cotta or marble. Booklet. 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp. A. I. A. File No. 7. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dusting and hardening concrete floors and accelerating the setting of concrete. Free distribution.

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet. 18 pp., 8½ x 11 ins. Deals with methods and materials used.

Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

The Vortex Mfg. Co., Cleveland, Ohio.
Par-Lock Specification "Forms A and B" for dampproofing and plaster key over concrete and masonry surfaces.

Par-Lock Specification "Form J" for dampproofing the wall surfaces that are to be plastered.

Par-Lock Dampproofing. Specification Forms C, F, I and J Sheets 8½ x 11 ins. Data on gun-applied asphalt dampproofing for floors and walls.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 55*

DOORS AND TRIM, METAL—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet. 8½ x 11 ins. 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp. 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins. 60 pp. Illustrated.

Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Baldor Electric Co., 4358 Duncan Avenue, St. Louis.
Baldor Electric Motors. Booklet, 14 pp., 8 x 10½ ins. Illustrated. Data regarding motors.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp. 8 x 10 ins. Illustrated.

"Electrical Specification Data for Architects." Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.

"The House of a Hundred Comforts." Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Pick & Company, Albert, 208 West Randolph St., Chicago, Ill.
School Cafeterias. Booklet. 9 x 6 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure. 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.

Variable-Voltage Central Systems as applied to Electric Elevators. Booklet, 13 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.

Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.

Electrical equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."

Westinghouse Panelboards and Cabinets (Catalog 42-A). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Important data on these details of equipment.

Beauty; Power; Silence; Westinghouse Fans (Dealer Catalog 45). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.

Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.

Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.

Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets. 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets. 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Escalators. Booklet. 8½ x 11 ins. 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet. 8½ x 11 ins. 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins. 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

Catalog and pamphlets. 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp. 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPROOFING

Concrete Engineering Co., Omaha, Nebr.
"Handbook of Fireproof Construction." Booklet. 53 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

FIREPROOFING—Continued

Genfire Steel Company, Youngstown, Ohio.
Fireproofing Handbook, 8½ x 11 ins. 32 pp. Illustrated. Gives methods of construction, specifications, data on Herringbone metal lath, steel, tile, Trussit solid partitions, steel joists. Self-Sentering formless concrete construction.

North Western Expanded Metal Co., 407 South Dearborn St., Chicago.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on Securing hardened dustproof concrete.

Concrete Floor Treatments—Specification Manual. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

FLOORS—STRUCTURAL

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet. 8½ x 11 ins. 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8½ x 11 ins. 40 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.

Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 ins. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.

Quality Sample Book. 3½ x 5¾ ins. Showing all gauges and thicknesses in the Armstrong line of linoleums.

Linoleum Layer's Handbook. 5 x 7 ins. 32 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

Enduring Floors of Good Taste. Booklet. 6 x 9 ins. 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for your Home. Brochure illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.

Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.

Blabon's Linoleum. Booklet illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.

Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

Bonded Floors Company, Inc., 1421 Chestnut St., Philadelphia, Pa.
A series of booklets, with full color inserts showing standard colors and designs. Each booklet describes a resilient floor material as follows:

Battleship Linoleum. Explains the advantages and uses of this durable, economical material.

Marble-ized (Cork Composition) Tile. Complete information on cork-composition marble-ized tile and many artistic effects obtainable with it.

Treadlite (Cork Composition) Tile. Shows a variety of colors and patterns of this adaptable cork composition flooring.

Natural Cork Tile. Description and color plates of this super-quiet, resilient floor.

Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.

Specifications for Resilient Floors. Leather bound booklet, 48 pp., 8½ x 11 ins. Illustrated. Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.
Bloxonend Flooring. Booklet. 3¼ x 6¼ ins. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.

File Folder. 9⅜ x 11¾ ins. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

Wichita, too, has a skyline of CARNEY CEMENT

UNION NATIONAL BANK
Wichita, Kan.
Architects—K. M. Vitzthum & Co.
Contractors—Geo. Seidhoff Const. Co.

HILLCREST APARTMENTS
Wichita, Kan.
Architects—Schmidt, Boucher & Overend
Contractors—Ellis & Singleton

ALL LAID UP IN CARNEY CEMENT

Nurses' Home, St. Francis Hospital
Brokers Office & Warehouse Co.
Salvation Army Rescue Home
Coleman Lamp Company
Uptown Theatre Building
Fourth National Bank
First Baptist Church
St. John's Academy
Wichita Elks Club
Bitting Building
Brown Building

THE consistency with which architects specify and approve Carney Cement mortar after one experience with it, is again forcibly brought out in Wichita's skyline. Her thirteen important new projects were all laid up in Carney Cement.

There is a definite significance in the fact that Carney Cement has been the leader in the mortar field for nearly a half century—we have always promised builders superlative mortar joints, and architects have come to know that that promise means something.

THE CARNEY COMPANY

DISTRICT SALES OFFICES

CHICAGO CINCINNATI DETROIT ST. LOUIS MINNEAPOLIS

Cement Makers Since 1883

CARNEY CEMENT

for Brick and Tile Mortar

Specifications
1 part Carney Cement to 3 parts sand

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 56*

FLOORING—Continued

Thomas Moulding Floor Co., 165 W. Wacker Drive, Chicago.
Better Floors. Folder. 4 pp. 11¼ x 13¾ ins. Illustrated. Floors for office, administration and municipal buildings.
Better School Floors. Folder, 4 pp., 11¼ x 13¾ ins. Illustrated.
Characteristics, Specifications and Uses. Brochure. 16 pp. 11¼ x 13¾ ins. Illustrated. Data on floors.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.
Pyrobar Floor Tile. Folder. 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

U. S. Rubber Co., 1790 Broadway, New York.
Period Adaptations for Modern Floors. Brochure. 8 x 11 ins. 60 pp. Richly illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Ars Ecclesiastica Booklet. 6 x 9 ins. 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet. 6 x 9 ins. 48 pp. Illustrations of theater chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet. 20 pp. 6¼ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet. 20 pp. 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 14 x 11 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh.
Forethought Furniture Plans. Sheets, 6¼ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

New York Galleries, Madison Avenue and 48th Street, New York.
A group of Distinguished Interiors. Brochure, 4 pp., 8¾ x 11¾ ins. Filled with valuable illustrations.

GARAGES

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.
Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.
Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 11 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

Mississippi Wire Glass Co., 220 Fifth Ave., New York.
Mississippi Wire Glass. Catalog. 3⅞ x 8½ ins. 32 pp. Illustrated. Covers the complete line.

GREENHOUSES

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.
Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.
Locks and Builders' Hardware. Bound Volume, 486 pp., 8½ x 11 ins. An exhaustive, splendidly prepared volume.
Colonial and Early English Hardware. Booklet, 48 pp. 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ ins. 8 pp. Illustrated.

McKinney Mfg. Co., Pittsburgh.
Forged Iron by McKinney. Booklet. 6 x 9 ins. Illustrated. Deals with an excellent line of builders' hardware.
Forged Lanterns by McKinney. Brochure, 6 x 9 ins. Illustrated. Describes a fine assortment of lanterns for various uses.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 89 pp., 16 x 10½ ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.

HARDWARE—Continued

Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail. Garage Hardware Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins. 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins. 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¼ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside. 4 pp. 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder. 8 pp. 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder. 8 pp. 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago.
Clow Gasteam Vented Heating System. Brochure, 24 pp. 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.
Dunham Radiator Trap. Bulletin 101, 8 x 11 ins. 12 pp. Illustrated. Explains working of this detail of heating apparatus.
Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins. 8 pp. Illustrated. A valuable brochure on valves.
Dunham Return Heating System. Bulletin 109. 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.
Dunham. Vacuum Heating System. Bulletin 110. 8 x 11 ins. 12 pp. Illustrated.
The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure. 12 pp. 8 x 11 ins. Illustrated. Deals with heating for small buildings.
The Dunham differential Vacuum Heating System. Bulletin 115. Brochure. 12 pp. 8 x 1 1ins. Illustrated. Deals with heating for large buildings.

Excelso Products Corporation, 119 Clinton St., Buffalo, N. Y.
Excelso Water Heater. Booklet. 12 pp. 3 x 6 ins. Illustrated. Describing the new Excelso method of generating domestic hot water in connection with heating boilers. (Firepot Coil eliminated.)

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200. 192 pp. 3½ x 6¾ ins. Important data on heating.

S. T. Johnson Co., Oakland, Calif.
Bulletin No. 4A. Brochure. 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.
Bulletin No. 31. Brochure. 8 pp. 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner With Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog. 8½ x 11 ins. 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.
Catalog No. 78. 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.
Catalog No. 79. 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

May Oil Burner Corp., Baltimore, Md.
Adventures in Comfort. Booklet. 24 pp. 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.
Taking the Quest out of the Question. Brochure. 16 pp. 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet. 3 pp. 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure. 3 pp. 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet. 8 pp. 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Milwaukee, Valve Co., Milwaukee, Wis.
MILVACO Vacuum & Vapor Heating System. Nine 4-p. bulletins, 8½ x 11 ins. Illustrated. Important data on heating.
MILVACO Vacuum & Vapor Heating Specialties. Nine 4-p. bulletins. 8½ x 11 ins. Illustrated. Deal with a valuable line of specialties used in heating.

Modine Mfg. Company, Racine, Wis.
Thermodine Unit Heater. Brochure. 24 pp. 8½ x 11 ins. Illustrated. Apparatus for industrial heating and drying.

SPEEDING UP INTERIOR WORK!

When a client tells you that he wants a quality job and wants it quickly, specify the Valentine *Four Hour* Finishes. They dry hard through in four hours—ready to rub or a second coat on the same day. In short, the job is done in half the usual time.

Four Hour Finishes, for *every* decorating job, are now available at competitive prices. They are of full body, they flow freely and brush easily. They will not skin over in the can nor gum up in the brush. They produce a tough, durable surface that can be washed with hot, soapy water without injury.

If you aren't already acquainted with the remarkable qualities of Valentine *Four Hour* varnishes and enamels, make your next job a test of these time saving finishes.

VALENTINE & COMPANY, 386 Fourth Ave., New York, N. Y.

VALENTINES FOUR HOUR FINISHES

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 58*

HEATING EQUIPMENT—Continued

Thermodine Cabinet Heater. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Cabinet heaters to buildings of different kinds.

Nash Engineering Company, South Norwalk, Conn.
No. 37. Devoted to Jennings Hytor Return Line Vacuum Heating Pumps, electrically driven, and supplied in standard sizes up to 300,000 square feet equivalent direct radiation.

No. 16. Dealing with Jennings Hytor Air Line Heating Pumps.

No. 17. Describing Jennings Hytor Condensation Pumps, sizes up to 70,000 square feet equivalent direct radiation.

No. 25. Illustrating Jennings Return Line Vacuum Heating Pumps. Size M, for equivalent direct radiation up to 5,000 square feet.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet. 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 27 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Heating Homes the Modern Way. Booklet, 8½ x 11¾ ins. Illustrated. Data on the Petro Burner.

Residence Oil Burning Equipment. Brochure, 6 pp., 8½ x 11 ins. Illustrated. Data regarding Petro Burner in a bulletin approved by Investigating Committee of Architects and Engineers.

Oil Heating Institute, 420 Madison Ave., New York.
What about the Supply of Oil Fuel? Booklet, 16 pp., 5½ x 8 ins. Illustrated.

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Petro Mechanical Oil Burner & Air Register. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Data on industrial installations of Petro Burners.

Present Accepted Practice in Domestic Oil Burners. Folder, 4 pp., 8½ x 11 ins. Illustrated. A reprint from Heating and Ventilating Magazine.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.
Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Tempervane Heating Units, Catalog 363. Booklet, 44 pp.,' 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.
Bulletin 14. 16 pp. 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.

Bulletin 20. 24 pp. 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.

How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 24th St. and Tenth Ave., New York City.
Catalog 426. 7 x 10 ins. 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

Holophane Company, 342 Madison Avenue, New York.
Lighting Specific for Hospitals. Booklet, 29 pp. 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet. 8½ x 11½ ins. 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

The Pick-Barth Companies, Chicago and New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 21 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Wilmot Castle Company, Rochester, N. Y.
Sterilizer Equipment for Hospitals. Book, 76 pp., 8½ x 11 ins. Illustrated. Gives important and complete data on sterilization of utensils and water, information on dressings, etc.

Sterilizer Specifications. Brochure, 12 pp., 8½ x 11 ins. Practical specifications for use of architects and contractors.

Architects' Data Sheets. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Information on piping, venting, valving and wiring for hospital sterilizer installations.

Hospital Sterilizing Technique. Five booklets. 8 to 16 pp. 6 x 9 ins. Illustrated. Deals specifically with sterilizing instruments, dressings, utensils, water, and rubber gloves.

HOTEL EQUIPMENT

Pick & Company, Albert, 208 West Randolph St., Chicago, Ill.
Some Thoughts on Furnishing a Hotel. Booklet. 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins. inside. Illustrated. Incinerator sanitation equipment for residence use.

INCINERATORS—Continued

A. I. A. File. 12 pp., 8¾ x 10¾ ins. inside. Suggestions for architect on incineration, showing installation and equipment.

Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins. inside, illustrated. A complete outline of the many advantages of incineration.

Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins. inside. Illustrated, explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins. 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

Sanitary Elimination of Household Waste, booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.

Garbage and Waste Disposal for Apartment Buildings, folder, 8½ x 11 ins. 16 pp. Illustrated. Describes principle and design of Kernerator-Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.

Sanitary Disposal of Waste in Hospitals. Booklet. 4 x 9 ins. 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.

The Kernerator (Chimney-fed) Booklet. Catalog No. 17. 20 pp. 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATING LUMBER

Masonite Corporation, 111 West Washington St., Chicago, Ill.
Booklet, 12 pp., 8½ x 11 ins. Illustrated. Gives complete specifications for use of insulating lumber and details of construction involving its use.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins. 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.

Insulation of Roofs to Prevent Condensation. Illustrated booklet. 7½ x 10½ ins. 36 pp. Gives full data on valuable line of roof insulation.

Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.

"The Cork Lined House Makes a Comfortable Home." 5 x 7 ins. 32 pp. Illustrated.

Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Insulating Quilt. Booklet. 7½ x 10½ ins. 24 pp. Illustrated. Deals with a valuable type of insulation.

Structural Gypsum Corporation, Linden, N. J.
Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.
Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

Genfire Steel Company, Youngstown, Ohio.
Steel Joists. 8½ x 11 ins. 32 pp. A. I. A. File Number 13G. Illustrated. Complete data on T-Bar and Plate-Girder joists, including construction details and specifications.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, restaurants and Cafeteria Applications of Monel Metal. Booklet. 8½ x 11 ins. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeteria Portfolio. 17 x 11 ins. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.

School Cafeterias. Booklet. 9 x 6 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York.
Hand Wrought Lanterns. Booklet, 5¼ x 6¼ ins. 20 pp. Illustrated in Black and White. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

Left—The West Jersey Homeopathic Hospital at Camden, New Jersey. Here 800 gallons of Barreled Sunlight have been used for interior painting—in pure white and buff tint.

Below—The Cooper Hospital, at Camden, New Jersey—a satisfied user of Barreled Sunlight for the past several years.

They are exacting *about their interior painting*

Pure, lustrous white—or easily tinted

By simply mixing colors in oil with Barreled Sunlight white, the painter on the job can easily obtain any desired shade. In quantities of five gallons or over we tint to order at the factory, without extra charge. For tinting small quantities our dealers carry handy tubes of Barreled Sunlight Tinting Colors.

THE two Camden, New Jersey, hospitals shown above are painted for lasting, cheerful cleanliness and good looks. Both of them use Barreled Sunlight as best fulfilling their exacting requirements.

Barreled Sunlight Gloss gives a rich enamel finish with a "depth" peculiar to itself. It reflects adequate light free from glare. Its surface is so smooth and unbroken it can't hold dirt embedded and washes like tile—without wearing away.

Barreled Sunlight Flat produces a surface extremely handsome and uniform.

Barreled Sunlight Semi-Gloss strikes a nice balance between the Gloss and Flat.

Containing no varnish, Barreled Sunlight flows with remarkable freedom, whether applied by brush or spray. And it possesses unusual opacity.

Guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

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U. S. Gutta Percha Paint Co., 3-L Dudley Street, Providence, R. I. Branches: New York, Chicago, San Francisco. Distributors in all principal cities.

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Please send me your booklet, "Information for Architects," and a panel painted with Barreled Sunlight. I am interested in the finish checked here:

Gloss ( ) Semi-Gloss ( ) Flat ( )

Name.....

Street.....

City..... *State*.....

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 60*

LATH, METAL AND REINFORCING

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 ins. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone. Rigid Metal Lath and interior plastering.

National Steel Fabric Co., Pittsburgh.
Better Walls for Better Homes. Brochure. 16 pp. 7¾ x 10¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder. 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅛ x 7⅜ ins. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative examples.

LAUNDRY MACHINERY

American Laundry Machinery Co., Norwood Station, Cincinnati, Ohio.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.

LIBRARY EQUIPMENT

Art Metal Construction Co., Jamestown, N. Y.
Planning the Library for Protection and Service. Brochure. 52 pp. 8½ x 11 ins. Illustrated. Deals with library fittings of different kinds.
Library Bureau Division, Remington Rand, N. Tonawanda, N. Y. Like Stepping into a Story Book. Booklet. 24 pp. 9 x 12 ins. Deals with equipment of Los Angeles Public Library.

LIGHTING EQUIPMENT

The Frink Co., Inc., 24th St. and 10th Ave., New York City.
Catalog 415, 8½ x 11 ins. 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York.
The Lighting of Schools: A Guide to Good Practice. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp. 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp. 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet. 24 pp. 8½ x 11 ins. Illustrated.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York.
Lighting Fixtures, Lamps and Candlesticks. 24 pp. 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rorchester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ ins. 8 pp. Illustrated.

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New Booklet. 24 pp., 5¼ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga., New York Office, 1328 Broadway.
Why Georgia Marble is Better. Booklet. 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅜ x 6 ins. 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

MARBLE—Continued

Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp. 8½ x 11 ins. Details.

METALS

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet, 6¼ x 3 ins. 166 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book. 9 x 11½ ins. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII incl. Booklet. 9 x 12 ins. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19½ x 23½ ins. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog, 7½ x 10 ins. 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.
The Pergola Catalog. 7½ x 10 ins. 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 183 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder. 8½ x 11 ins. 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 6½ x 3¼ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something new in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco-coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York.
A book of Old English Designs. Brochure. 47 plates. 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume. 183 plates. 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet. 23 plates. 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains. Booklet. 4 x 8½ ins. 16 pp. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins. 100 pp. Gives directions and formulae for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet, 6¼ x 3½ ins. 16 pp. Illustrated. Directions and formulae for painting metals.
Came Lead. Booklet, 8¾ x 6 ins. 12 pp. Illustrated. Describes various styles of lead cames.

Pratt & Lambert, Inc., Buffalo, N. Y.
Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 ins. 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.
Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2, 8½ x 11 ins. 12 pp. Illustrated. Thorough discussion, including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.
Painting and Decorating of Interior Walls. Bulletin No. 3. 8½ x 11 ins. 20 pp. Illustrated. An excellent reference book on Flat Wall Finish, including texture effects, which are taking the country by storm. Every architect should have one on file.
Protective Paints for Metal Surfaces. Bulletin No. 4. 8½ x 11 ins. 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Avenue, New York.
Paint Specifications. Booklet, 8½ x 10¾ ins. 4 pp.

U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

Valentine & Co., 456 Fourth Ave., New York.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 ins. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 23 pp., 7 x 8½ ins. A useful work on the upkeep of residences.
Architectural Four-Hour Varnishes and Enamels. Booklet, 8 pp., 4½ x 6 ins. Data on a useful line of materials.

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To help your client Select the Color

WALLS, CEILING, wood trim, floors and draperies should show a harmonious color contrast. Oftentimes in the past your ideas on color and those of your client have been at variance on this important point. With the handy Pee Gee Color Selector it is easy to arrive at an agreeable decision in a few moments.

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PEASLEE-GAULBERT COMPANY
Incorporated
LOUISVILLE

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 62*

PAPER

A. P. W. Paper Co., Albany, N. Y.
"Here's a Towel Built for Its Job." Folder, 8 pp., 4 x 9 ins. Deals with "Onliwon" paper towels.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.
Architects' Portfolio. Booklet, 12 pp. 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.
Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ ins. 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog. 8¼ x 11 ins. 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for erecting Telesco Partitions. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet. 7 x 10 ins. 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush door partitions.

U. S. Gypsum Co., Chicago.
Pyrobar Partition and Furring Tile. Booklet. 8½ x 11 ins. 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1. Brass Pipe for Water Service. 8½ x 11 ins. 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.
How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "A." 4 x 16½ ins. 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.
Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Inc., Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 8½ x 11 ins., illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe. 8½ x 11 ins. 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins. 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deaerating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins. 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp. 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.
Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

C. F. Church Mfg. Co., Holyoke, Mass.
Catalog S. W.-3. Booklet, 95 pp., 7¾ x 10½ ins. Illustrated. Data on Sani-White and Sani-Black toilet seats.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "M." 9¼ x 12 ins. 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

PLUMBING EQUIPMENT—Continued

Crane Company, 836 S. Michigan Ave., Chicago, Ill.
Plumbing Suggestions for Home Builders. Catalog. 3 x 6 ins. 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog. 4 x 6½ ins. 34 pp. Illustrated.
Planning the Small Bathroom. Booklet. 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.
Douglas Plumbing Fixtures. Bound Volume. 200 pp. 8½ x 11 ins. Illustrated. General catalog.
Another Douglas Achievement. Folder. 4 pp. 8½ x 11 ins. Illustrated. Data on new type of stall.
Hospital. Brochure. 60 pp. 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog "K." 10⅞ x 7⅞ ins. 242 pp. Illustrated. Complete data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.
The Blue Book of Plumbing. Bound volume. 181 pp. 8½ x 10½ ins. Illustrated.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¼ ins. 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

The Trane Co., LaCrosse, Wis.
Trane Small Centrifugal Pumps. Booklet. 3¾ x 8 ins. 16 pp. Complete data on an important type of pump.

Weil Pump Co., 215 W. Superior St., Chicago.
Pumps. Booklet, 8½ x 11 ins. Illustrated. Individual bulletins with specifications on sewage ejectors, and bilge, house, condensation, booster and boiler feed pumps.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.
Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.
Temperature Control of Refrigeration Systems. Booklet. 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

REINFORCED CONCRETE—See also Construction, Concrete

Genfire Steel Company, Youngstown, Ohio.
Self-Centering Handbook. 8½ x 11 ins. 36 pp. Illustrated. Methods and specifications on reinforced concrete floors, roofs and floors with a combined form and reinforced material.

North Western Expanded Metal Company, Chicago, Ill.
Designing Data. Book. 6 x 9 ins. 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

Truscon Steel Company, Youngstown, Ohio.
Shearing Stresses in Reinforced Concrete Beams. Booklet. 8½ x 11 ins. 12 pp.

ROOFING

The Barrett Company, 40 Rector St., New York City.
Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure. 63 pp. 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Bird & Son, Inc., E. Walpole, Mass.
Bird's Roofs. Folder, 16 pp., 3½ x 6 ins. Illustrated. Data of roofing materials.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver.
Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.
Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.
Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and southern California.
Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

MURPHY FINE FINISHES

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 64*

ROOFING—Continued

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet. 8½ x 11 ins. 4 pp. Illustrated. For architects who desire something out of the ordinary, this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Roof Construction. Booklet. 8 x 11 ins. 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.
Sheetrock Pyrofill Roof Construction. Folder. 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets. 7¾ x 10¼ ins. 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

SCREENS

American Brass Co., The, Waterbury, Conn.
Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.
Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8⅝ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SOUND DEADENER

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Deadening Quilt. Brochure, 7½ x 10½ ins., 28 pp. Illustrated. Gives complete data regarding a well-known protection against sound.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 ins. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone.
Rigid Metal Lath and interior plastering.
Fireproofing Handbook. 8½ x 11 ins. 32 pp. Illustrated. Describes the full line of products manufactured by the Genfire Steel Company.

Steel Frame House Company, Pittsburgh. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp. 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp. 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp. 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 ins. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.

STONE, BUILDING—Continued

Vol. 4. Series B. Booklet. New Edition. 8½ x 11 ins. 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio. 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6, Series B—Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pages. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Avenue, Chicago, Ill.
Catalog No. 31. Series 500. All-Copper Construction. Illustrated brochure. 20 pp. 8½ x 11 ins. Deals with store fronts of a high class.
Brasco Copper Store Fronts. Catalog No. 32. Series 202.
Brasco Standard Construction. Illustrated brochure. 16 pp. 8½ x 11 ins. Complete data on an important type of building.
Detail Sheets. Set of seven sheets; printed on tracing paper, showing full sized details and suggestions for store front designing, enclosed in envelope suitable for filing. Folds to 8½ x 11 ins.
Davis Solid Architectural Bronze Sash. Set of five sheets, printed on tracing paper, giving full sized details and suggestions for designing of special bronze store front construction, enclosed in envelope suitable for filing. Folds to 8½ x 11 ins.

The Kawneer Company, Niles, Mich.
Store Front Suggestions. Booklet, 96 pp., 6 x 8½ ins. Illustrated. Shows different types of Kawneer Solid Copper Store Fronts.
Catalog K. 1927 Editon. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Details of Kawneer Copper Store Fronts.
Detail Sheets for Use in Tracing. Full-sized details on sheets 17 x 22 ins.
Kawneer Construction in Solid Bronze or Copper. Booklet, 64 pp., 8½ x 11 ins. Illustrated. Complete data on the subject.

Modern Bronze Store Front Co., Chicago Heights, Ill.
Introducing Extruded Bronze Store Front Construction. Folder, 4 pp., 8½ x 11 ins. Illustrated. Contains full sized details of metal store fronts.

Zouri Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog. 8½ x 10½ ins. 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog. 8½ x 10 ins. 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure. 8½ x 11 ins. 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised. Edition. Permanently bound volume, 9⅛ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins. 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins. 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 ins. 32 pp. Illustrated. A treatise on the subject of hollow tile wall construction.
Standard Fireproofing Bulletin 171. 8½ x 11 ins. 32 pp. Illustrated. A treatise on the subject of hollow tile as used for floors, girder, column and beam covering and similar construction.
Natco Double Shell Load Bearing Tile Bulletin. 8½ x 11 ins. 6 pp. Illustrated.
Natco Uninbacker Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natcoflor Bulletin. 8½ x 11 ins. 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.

TILES

Kraftile Company, 55 New Montgomery St., San Francisco.
High Fired Faience Tile. Booklet. 32 pp. 8½ x 11 ins. Illustrated. Presents a fine line of tiles for different purposes.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

Permanent beauty of dull-finished wood trim is assured with

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BOTH the exterior and interior of this building, dedicated to the cultivation of ideals, express the warmth and charm so desirable in structures of this type. This atmosphere has been largely secured by appropriate architectural design and by the liberal use of wood trim inside.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 66*

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago.
The Dunham Packless Radiator Valve Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Bros., 80 White St., New York.
The Valve Behind a Good Heating System. Booklet. 4½ x 7¼ ins. 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.

Jenkins Valves for Plumbing Service. Booklet. 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet. 7 x 10 ins., 24 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 ins. Data on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder. 8 x 10½ ins. 8 pp. Data regarding fans for ventilation of laboratory fume hoods.

Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Globe Ventilator Company, 205 River St., Troy, N. Y.
Globe Ventilators Catalog. 6 x 9 ins. 32 pp. Illustrated profusely. Catalog gives complete data on "Globe" ventilators as to sizes, dimensions, gauges of material and table of capacities. It illustrates many different types of buildings on which "Globe" ventilators are in successful service, showing their adaptability to meet varying requirements.

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet. 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dustproofing and hardening concrete floors, and accelerating the setting of concrete. Free distribution.

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.

Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Sommers & Co., Ltd., 342 Madison Ave., New York City.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Pamphlet. 3¾ x 8¾ ins. 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

The Vortex Mfg. Co., 1978 West 77th St., Cleveland, Ohio.
Par-Lock Specification "Form D" for waterproofing surfaces to be finished with Portland cement or tile.

Par-Lock Specification "Forms E and G" membrane waterproofing of basements, tunnels, swimming pools, tanks to resist hydrostatic pressure.

Par-Lock Waterproofing. Specification Forms D, E, F and G. Sheets, 8½ x 11 ins. Data on combinations of gun-applied asphalt and cotton or felt membrane, built up to suit requirements.

Par-Lock Method of Bonding Plaster to Structural Surfaces. Folder, 6 pp. 8½ x 11 ins. Official Bulletin of Approved Products,—Investigating Committees of Architects and Engineers.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet. 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

WINDOWS

The Kawneer Company, Niles, Mich.
Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8⅝ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

Crittall Casement Window Co., 10951 Hearn Ave., Detroit, Mich.
Catalog No. 22. 9 x 12 ins. 76 pp. Illustrated. Photographs of actual work accompanied by scale details for casements and composite steel windows for banks, office buildings, hospitals and residences.

Genfire Steel Company, Youngstown, Ohio.
Architectural Details, Casement Windows and Doors. 8½ x 11 ins. 28 pp. A. I. A. File No. 16e. Specifications and construction details.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog. 12¼ x 18½ ins. 30 pp. Illustrated. Full size details of outward and inward opening casements.

The Kawneer Company, Niles, Mich.
Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 20 pp. 8⅝ x 11 ins. Illustrated brochure on casements, particularly for residences.

Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.

Architectural Details. Booklet. 8½ x 11 ins. 16 pp. Tables of specifications and typical details of different types of construction.

List of Parts for Assembly. Booklet. 8½ x 11 ins. 16 pp. Full lists of parts for different units.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

WINDOWS, STEEL AND BRONZE

Genfire Steel Company, Youngstown, Ohio.
Architectural Details, Steel Pivoted, Commercial and Architectural Projected Windows. 8½ x 11 ins. 24 pp. A. I. A. File No. 16e. Specification and construction details.

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅝ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.

How Windows Can Make Better Homes. Booklet. 3⅞ x 7 ins. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book. 8½ x 11 ins. 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.

Truscon Solid Steel Double-Hung Windows. 24 pp. Booklet. 8½ x 11 ins. Containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.

Continuous Steel windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.
American Walnut. Booklet. 7 x 9 ins. 45 pp. Illustrated. A very useful and interesting little book on the use of Walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.

"American Walnut for Interior Woodwork and Paneling." 7 x 9 ins. Pages illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.
Better Built Homes. Vols. XV-XVIII, incl. Booklet. 9 x 12 ins. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects, for the Curtis Companies.

National Lumber Mfrs. Assn., Washington.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.

New York Life Insurance Company Building, New York. Cass Gilbert, Inc., architects. Equipped with plumbing fixtures made from Solid Nickel Silver by the Meyer-Sniffin Co., New York.*

SOLID NICKEL SILVER* PLUMBING FIXTURES by MEYER-SNIFFIN

Solid Nickel Silver, with its unusually attractive color—with its brightness and lustre—adds a note of permanence and quality found in no other suitable material. It is corrosion-resisting. It is easy to clean. Even under severe use Solid Nickel Silver plumbing fixtures will not lose their silvery lustre or become unsightly... The toughness and wear-resistance of Solid Nickel Silver plumbing fixtures surpass those of materials more commonly employed. When properly prepared with a sufficiently high percentage of Nickel, they possess a hardness and color comparable to Pure Nickel... Solid Nickel Silver plumbing fixtures are manufactured on a production basis by many fabricators of sanitary equipment. They meet the requirements of architects who welcome the opportunity to specify the most modern type of equipment.

18% 22 Nickel SILVER

[*Diamond Metal is the name used by the Meyer-Sniffin Co. to identify its Nickel alloy used in manufacturing Nickel Silver plumbing fixtures. This is a solid white metal and contains a high percentage of Nickel.]

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The BRILLIANT CRODON FINISH
- - - of plumbing fixtures never will water-spot, tarnish or corrode - -

Fixtures by Peck Bros. and Co.

BRIGHT gleaming surfaces . . . beautiful to the eye . . . non-tarnishing . . . everlasting even though handled constantly . . . these are CRODON features that greatly improve the life-long appearance of plumbing fixtures.

For CRODON'S initial lustre does not fade with time. Bathroom, kitchen and public wash room fixtures, plated with this durable chromium plate, retain their beauty always.

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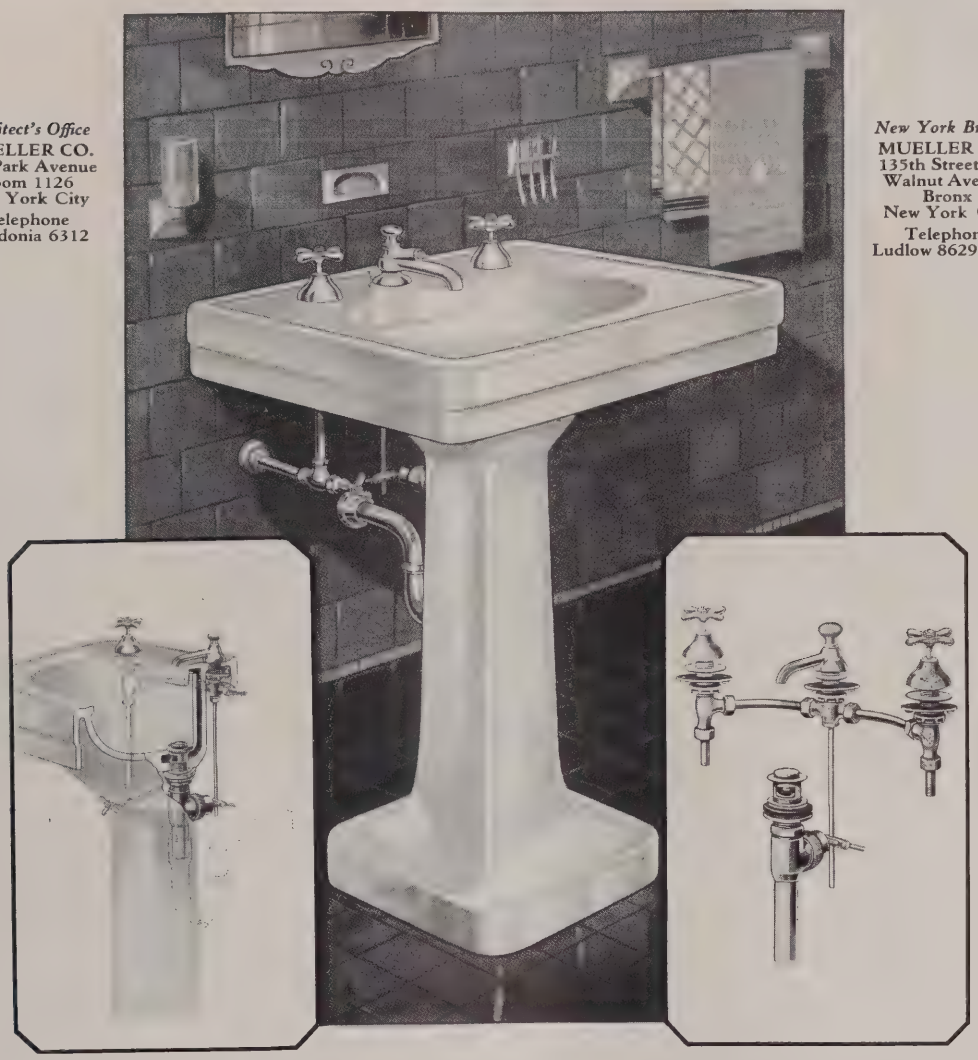

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The new Mueller All Metal Chromium Plated Lavatory Combination has met the modern demand for better and more beautiful toilet appurtenances.

Spouts are furnished in two lengths —short for enameled iron lavatories and long for those of vitreous china with hooded overflows. The brilliant luster of this fitting is in perfect harmony with colorful surroundings and it is serviceable as only Mueller products can be.

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World's Largest Manufacturers of Plumbing Brass Goods
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MUELLER

PLUMBING BRASS AND VITREOUS WARE

A Constant Progress in Beauty! That, in a phrase, sums up the growth of the Kohler line of plumbing fixtures and fittings. The illustration, reproduced from a strikingly handsome back cover in color in the December 15th issue of Liberty Magazine, shows two of the newest Kohler patterns—the *Bellaires* vitreous china lavatory and the *Mayfair* bath. New beauty of design, new beauty of color, new beauty of Kohler-quality fittings in gold, chromium, or nickel . . . there is a *threefold* inspiration for the Architect who works with Kohler Ware!

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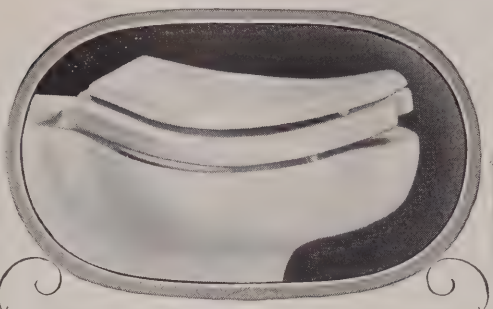
One of thousands of residences equipped with Te-pe-co ware.



This Office Building at 90 Worth St. is one of many of New York's famous Skyline Te-pe-co equipped.

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Provided with scientific Saddle Seat

THE "modern" plumbing of only a decade ago is decidedly out of date today. Higher standards of health, of comfort, of sanitation have demanded better and better fixtures.

The very shape of the quiet Si-wel-clo indicates how much consideration has been given to the subject. Notice how the dip in the rim elevates the front and rear of the bowl opening, minimizing the possibility of soiling. The comfort of this saddle seat encourages the natural seating position of the body, aiding organs and muscles to function thoroughly and naturally.

Even before this scientific saddle seat became known the Si-wel-clo achieved distinction because of its extremely quiet operation. By doing away with noisy, gurgling and dripping sounds —quite embarrassing when guests are present—the Si-wel-clo has won a host of friends.

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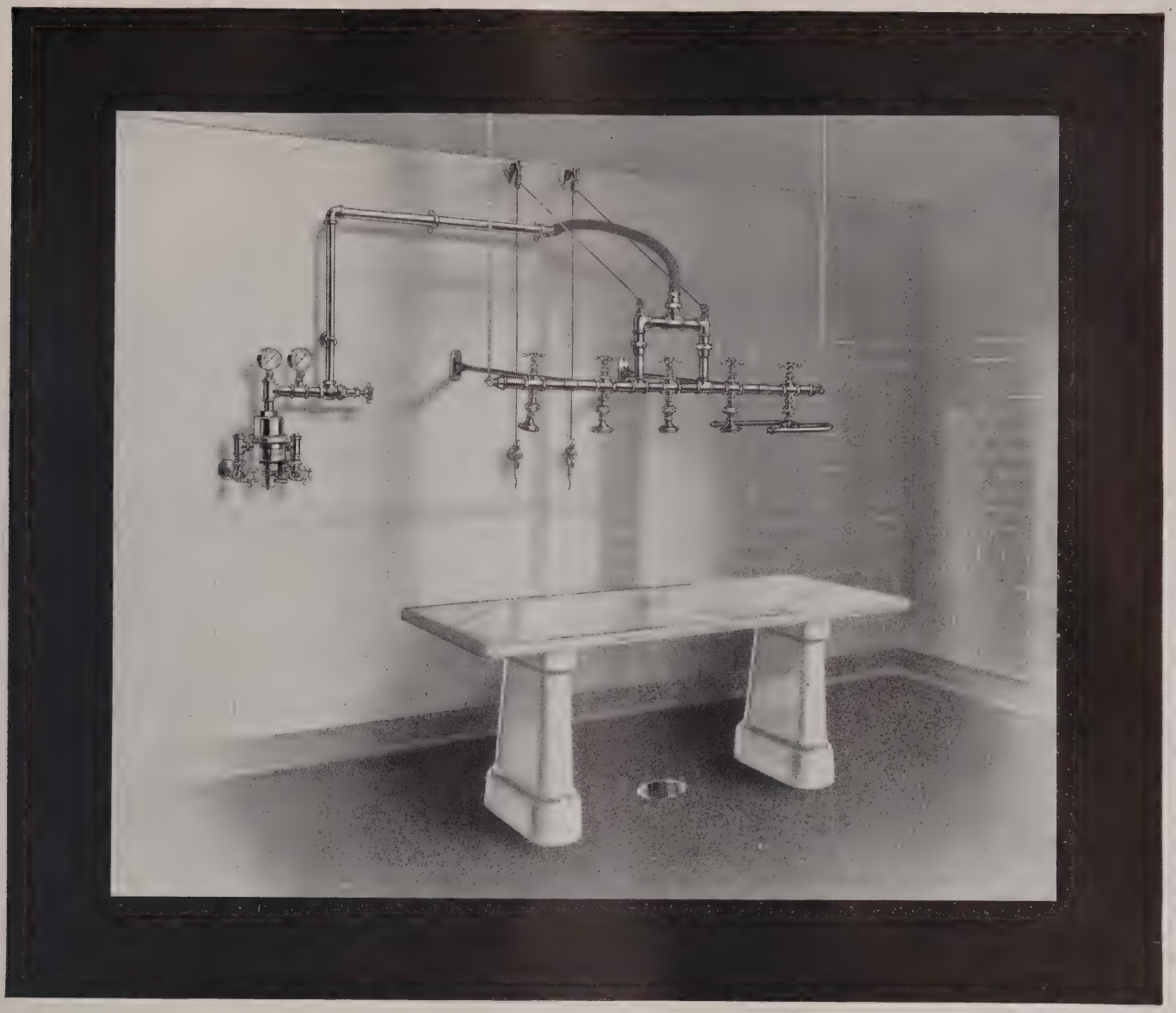

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The Importance of Properly Hanging Lateral and Vertical Lines of Soil Pipe!

By Joseph J. Crotty

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Strength Where Strength Is Needed Most

Patent Applied For

A MOST important essential in soil pipe construction is the proper placing of hangers on vertical stacks and lateral runs of soil pipe to guard against displacement or sagging. Some practical ideas that meet this situation in modern plumbing design are presented herewith.

A, B and C on the drawing show types of concrete inserts used for attaching pipe hangers. These inserts are placed in the false work and become firmly imbedded when the concrete is poured. The accompanying drawing shows a vertical soil stack, 4″ in size, connected at basement to a horizontal run of 8″ soil pipe. Different types of pipe hangers are shown in detail, and their use illustrated in both reinforced concrete construction, and buildings wherein steel work is used.

Cast iron pipe rests for vertical stacks are not recommended, particularly where they are arranged so as to span the opening through which the soil stack occurs.

Friction hangers made of wrought strap iron properly bolted represent by far the best anchorage for vertical soil stacks. A spacing of 8′ between hangers on lateral runs is considered the best practice from 2″ to 8″ soil pipe. Upon larger sizes of soil pipe, the spacing should be closer. A certain flexibility may be observed in connection with this rule on smaller sizes of pipe than 4″, although in certain types of construction, the question of vibration must always be considered, and for that reason departure from the 8′ spacing between hangers, is not recommended.

Figure 1 shows a ring and bolt hanger.

Figure 2 shows an adaptation of the cradle hanger to use on a vertical stack run on the face of a steel beam. As shown in the illustration the bolts for the cradle hanger have hooks which enable them to fit securely over the flange of beam, and by tightening the nuts on the bolts the stack is rigidly anchored.

Figure 3 is a closed hanger which must be used before the pipe is caulked together as the ring must be slipped over the pipe.

Figure 4 shows a very practical method of hanging vertical stacks. It can be made in all lengths and is dependable for use in spanning openings through which the soil pipe stack is brought up.

Figures 5 and 6 are variations of the same method.

Figures 7 and 9 hangers may be used in connection with a long threaded bolt which permits the proper adjustment to hang a horizontal run of soil pipe and maintain the pitch as laid out by the plumber.

Figure 8 is what is known as a cradle hanger. There are many different ways in which this hanger can be used to advantage. The bolts are sometimes dropped through large plate washers which bear directly on the concrete. Proper adjustment to the pipe is secured by reason of the threads and nuts upon which the cradle hanger rests.

Figures 10 and 11 show types of beam clamps that may be used in conjunction with hangers for horizontal runs of soil pipe.

The use of light strap iron, wire or link chains, which have a tendency to stretch, is not advocated as sound practice.

Since it is universally acknowledged by architects and engineers that cast iron soil pipe for drainage makes for a permanence far superior to pipe of all other materials, this article is particularly addressed to the *Plumbing Contractor*. The proper hanging of soil pipe calls for the use of hangers as permanent as the pipe itself.

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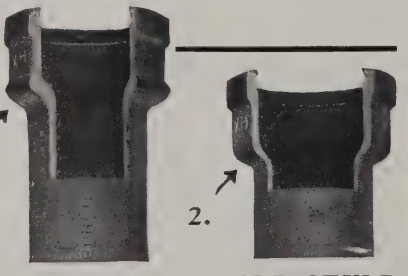
SOIL PIPE



OLD STYLE

Which Soil Pipe? Compare photo 1 with photo 2. Note thin easily broken wall at base of hub in old style pipe. See how this glaring weakness has been eliminated in NUHUB pipe.

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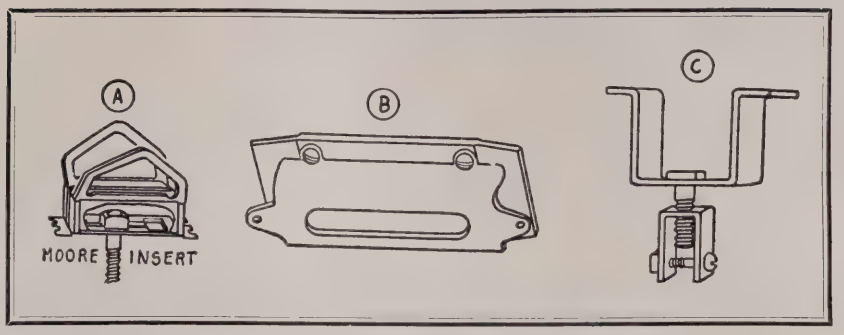
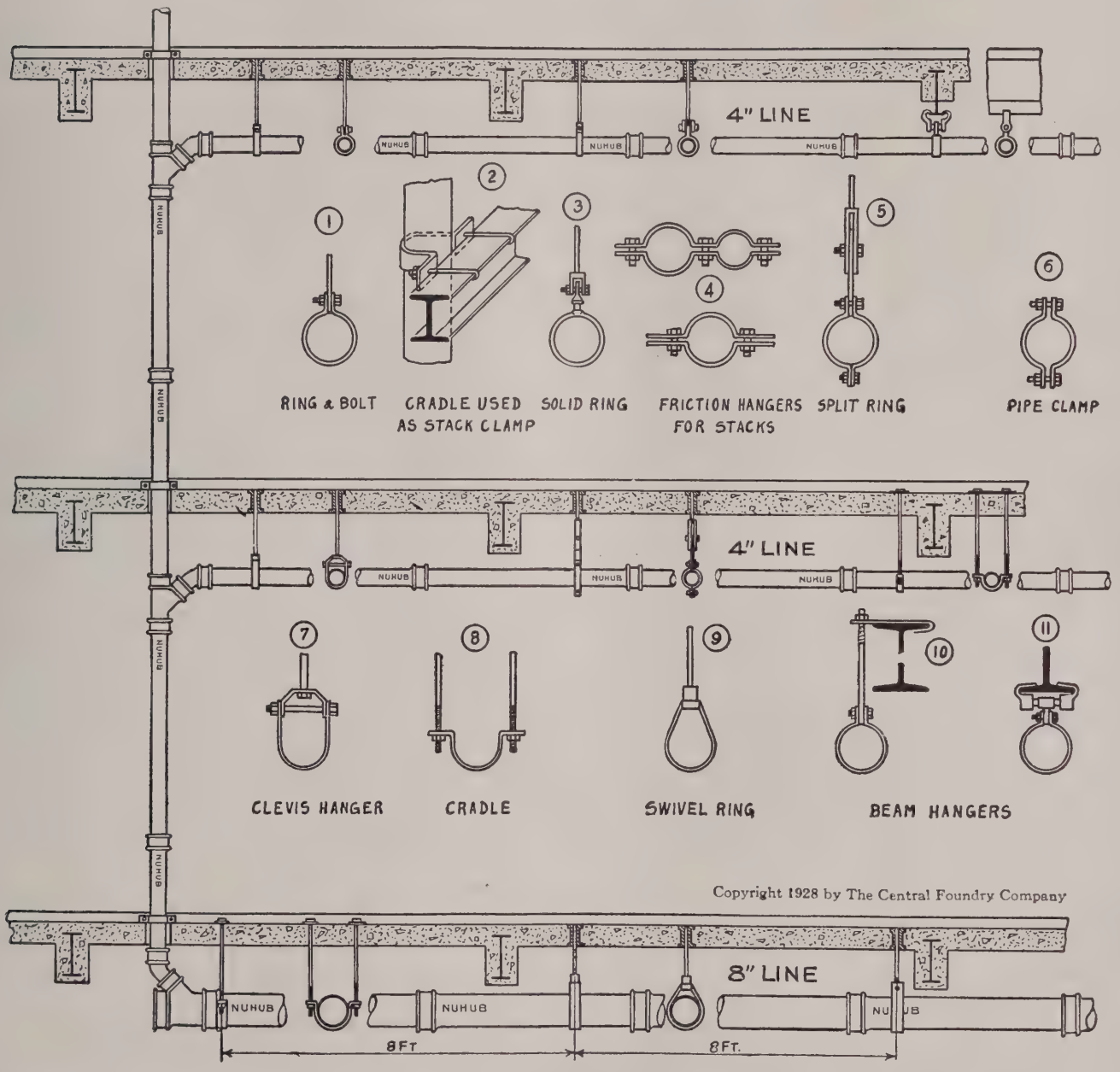
of this valuable contribution to Modern Plumbing Design may be had by addressing
THE CENTRAL FOUNDRY COMPANY
420 Lexington Avenue, New York

"A", "B" and "C" show types of concrete inserts used for attaching pipe hangers. These inserts are fastened to the false work and become firmly imbedded when the concrete is poured.



Proper Hanging of Soil Pipe calls for *Hangers as permanent as the Pipe itself!*



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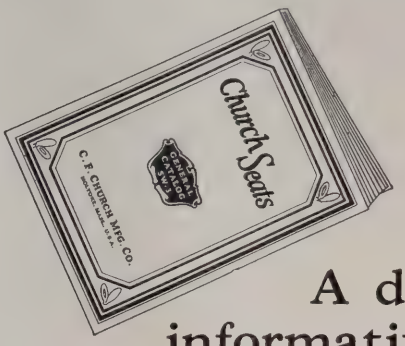

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2. St. John's Hospital, St. Louis, Mo.
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3. Hatcher Hospital, Winfield, Kansas
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4. Muncipal Hospital, Shawnee, Okla.
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5. Kitchen of The Jewish Hospital, Cincinnati, Ohio.
Ventilating hood and ducts of ARMCO Ingot Iron
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The Engineer: Carl J. Keifer, Cincinnati, O.

6. Tacoma General Hospital, Tacoma, Wash.
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The Architects: Sutton, Whitney & Dugan, Tacoma, Wash.

but—*why repeat our mistake?*

IT'S the old story over again, Mr. Ralston. I know you want to keep your costs down—every owner does. Frankly, I'm prejudiced against cheap pipe. Why, the pipes in the old building are the worry of my life; and they aren't ten years old! I actually lie awake nights wondering where they'll break next; and every morning when I get on the job, I'm almost afraid to ask how things are.

Yes, but this new pipe is different, I'm convinced of that. The manufacturers are a very big concern, you know—and very successful; and they've no end of evidence as to the merits of their product. Some well known metallurgists consider it even better than wrought iron. The world hasn't stood still for ten years, Briggs; and there's been a great improvement in pipe making.

That's just what we were told ten years ago, Mr. Ralston; and we changed from Byers to the cheaper pipe after our specifications had all been made up. The architects will bear me out in this, I'm sure. You remember, don't you, Mr. Whitman? I thought so.

I'd forgotten that.

Oh, yes. Every known merit or advantage of Byers was supposed to be equalled or bettered, for less money. There's nothing new in these technical, metallurgical arguments, either. As for evidence, there's just one evidence of the durability of pipe, I've learned, and that's its length of life in actual service.

Naturally, I don't want to repeat old mistakes. Remember, though, that we stand to save a clean $2,000 on pipe alone.

Two thousand dollars wouldn't pay our pipe repair bills for a single year. They're burdensome now, and growing worse all the time.

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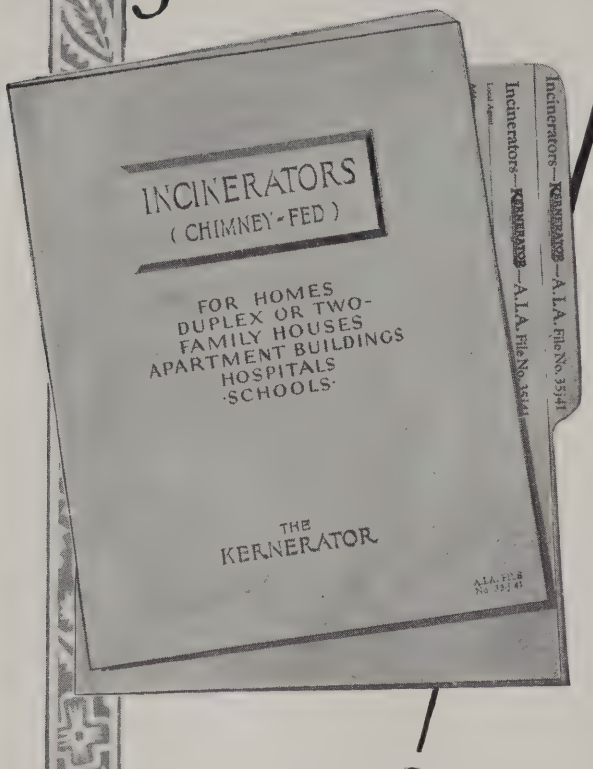

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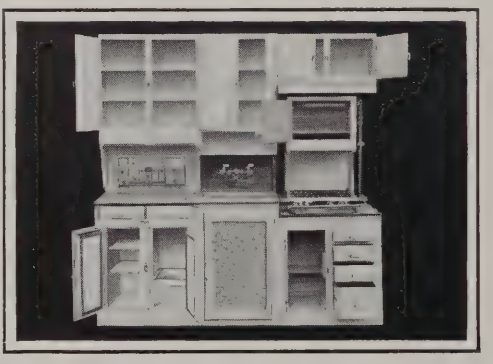

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Left—Presbyterian Hospital, Denver, Colorado. 8,000 sq. ft. of T-M-B—W. E. and A. A. Fisher, Architects.

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The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge, unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 383 Madison Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

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Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

AIR FILTERS

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

BASEMENT WINDOWS

Genfire Steel Company, Youngstown, Ohio
Architectural Details. Booklet, 28 pp., 8½ x 11 ins. Details on steel windows. A. I. A. File No. 16E.

BATHROOM FITTINGS

A. P. W. Paper Co., Albany, N. Y.
Onliwon for Fine Buildings. Folder, 8 pp., 3¼ x 6 ins. Illustrated. Deals with toilet paper fittings of metal and porcelain.

Architects' File Card. 8½ x 11 ins. Illustrated. Filing card on toilet paper and paper towel cabinets.

A Towel Built for Its Job. Booklet, 8 pp., 4¼ x 9⅝ ins. Illustrated. Paper Towel System and Cabinets.

Cabinets and Fixtures. Booklet, 31 pp., 5¾ x 4¾ ins. Illustrated. Catalog and price list of fixtures and cabinets.

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Common Brick Mfrs. Assn. of America, 2134 Guarantee Title Bldg., Cleveland.
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The Heart of the Home. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.

Skintled Brickwork. Brochure, 15 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.

Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.

Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook, 8½ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Missouri Portland Cement Company, St. Louis, Kansas City, Memphis.

Twenty-four Hour Cement. Booklet, 15 pp., 8½ x 11 ins. Illustrated. Data on a cement which makes a quick-drying concrete.

Precautions for Concrete Paving Construction in Cold Weather. Folder, 4 pp. 6 x 9 ins.

Design and Control of Concrete Mixtures. Booklet, 32 pp. 8½ x 11 ins. Illustrated.

Concrete Paving Construction in Hot Weather. Booklet. 11 pp. 6 x 9 ins. Illustrated.

Pennsylvania-Dixie Cement Corp'n, 131 East 46th St., New York.
Celluloid Computing Scale for Concrete and Lumber, 4⅝ x 2½ ins. Useful for securing accurate computations of aggregates and cement; also for measuring lumber of different sizes.

Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

CEMENT—Continued

Town and Country Houses of Concrete Masonry. Booklet, 19 pp., 8½ x 11 ins. Illustrated.

Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

The Kev to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Design and Control of Concrete Mixtures. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

Concrete in Architecture. Bound Volume. 60 pp., 8½ x 11 ins., Illustrated. An excellent work, giving views of exteriors and interiors.

CONCRETE BUILDING MATERIALS

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Cosmos Portland Cement. Folder, 1 p., 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure. 16 pp. 8½ x 11 ins. Illustrated. Data on coloring for floors.

Dychrome. Concrete Surface Hardener in Colors. Folder. 4 pp. 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 ins. 32 pp. Illustrated. A treatise on fireproof floor construction.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill

Northwestern Expanded Metal Products. Booklet. 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plaster-Sava and Longspan lath channels, etc.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.

Pressure Relieving Joint for Buildings of stone, terra cotta or marble. Booklet. 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp. A. I. A. File No. 7. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dusting and hardening concrete floors and accelerating the setting of concrete. Free distribution.

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet. 18 pp., 8½ x 11 ins. Deals with methods and materials used.

Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

The Vortex Mfg. Co., Cleveland, Ohio.
Par-Lock Specification "Forms A and B" for dampproofing and plaster key over concrete and masonry surfaces.

Par-Lock Specification "Form J" for dampproofing tile wall surfaces that are to be plastered.

Par-Lock Dampproofing. Specification Forms C, F, I and J Sheets 8½ x 11 ins. Data on gun-applied asphalt dampproofing for floors and walls.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 149*

DOORS AND TRIM, METAL—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet. 8½ x 11 ins. 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp. 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins. 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Baldor Electric Co., 4358 Duncan Avenue, St. Louis.
Baldor Electric Motors. Booklet, 14 pp., 8 x 10½ ins. Illustrated. Data regarding motors.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp. 8 x 10 ins. Illustrated.

"Electrical Specification Data for Architects." Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.

"The House of a Hundred Comforts." Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Pick & Company, Albert, 208 West Randolph St., Chicago, Ill.
School Cafeterias. Booklet. 9 x 6 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure. 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.

Variable-Voltage Central Systems as applied to Electric Elevators. Booklet, 13 pp., 8½ x 11 ins. Illustrated. Deals with and important detail of elevator mechanism.

Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.

Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."

Westinghouse Panelboards and Cabinets (Catalog 42-A). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Important data on these details of equipment.

Beauty; Power; Silence; Westinghouse Fans (Dealer Catalog 45). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.

Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.

Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.

Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets. 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets. 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Escalators. Booklet. 8½ x 11 ins. 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet. 8½ x 11 ins. 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins. 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

Catalog and pamphlets. 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp. 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPROOFING

Concrete Engineering Co., Omaha, Nebr.
"Handbook of Fireproof Construction." Booklet, 53 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

FIREPROOFING—Continued

Genfire Steel Company, Youngstown, Ohio.
Fireproofing Handbook, 8½ x 11 ins. 32 pp. Illustrated. Gives methods of construction, specifications, data on Herringbone metal lath, steel, tile, Trussit solid partitions, steel joists. Self-Sentering formless concrete construction.

North Western Expanded Metal Co., 407 South Dearborn St., Chicago.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on Securing hardened dustproof concrete.

Concrete Floor Treatments—Specification Manual. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

FLOORS—STRUCTURAL

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet. 8½ x 11 ins. 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8½ x 11 ins. 40 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.

Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 ins. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.

Quality Sample Book. 3½ x 5¾ ins. Showing all gauges and thicknesses in the Armstrong line of linoleums.

Linoleum Layer's Handbook. 5 x 7 ins. 32 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

Enduring Floors of Good Taste. Booklet. 6 x 9 ins. 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for your Home. Brochure illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.

Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.

Blabon's Linoleum. Booklet illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.

Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

Bonded Floors Company, Inc., 1421 Chestnut St., Philadelphia, Pa.
A series of booklets, with full color inserts showing standard colors and designs. Each booklet describes a resilient floor material as follows:

Battleship Linoleum. Explains the advantages and uses of this durable, economical material.

Marble-ized (Cork Composition) Tile. Complete information on cork-composition marble-ized tile and many artistic effects obtainable with it.

Treadlite (Cork Composition) Tile. Shows a variety of colors and patterns of this adaptable cork composition flooring.

Natural Cork Tile. Description and color plates of this super-quiet, resilient floor.

Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.

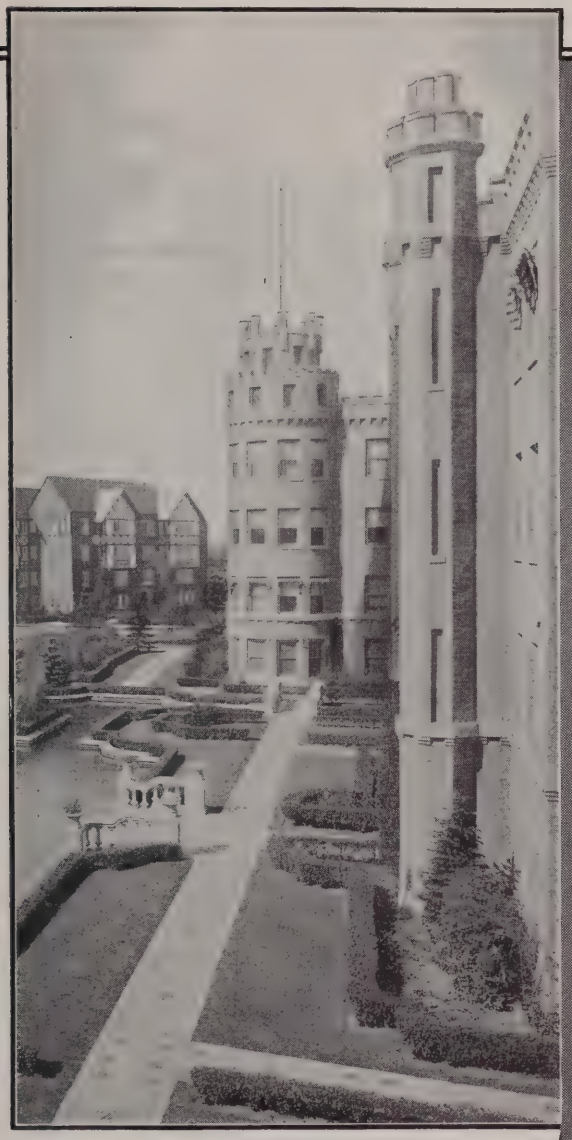
Specifications for Resilient Floors. Leather bound booklet, 48 pp., 8½ x 11 ins. Illustrated. Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.

Bloxonend Flooring. Booklet. 3¼ x 6¼ ins. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.

File Folder. 9⅜ x 11¾ ins. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

Co-operating with Co-operative apartments



Park Gables, one of seven buildings comprising the Indian Boundary Park Co-operative Apartment Development, Chicago, Ill. Gubbins, McDonnell & Blietz, realtors. Mr. James F. Denson, Architect.

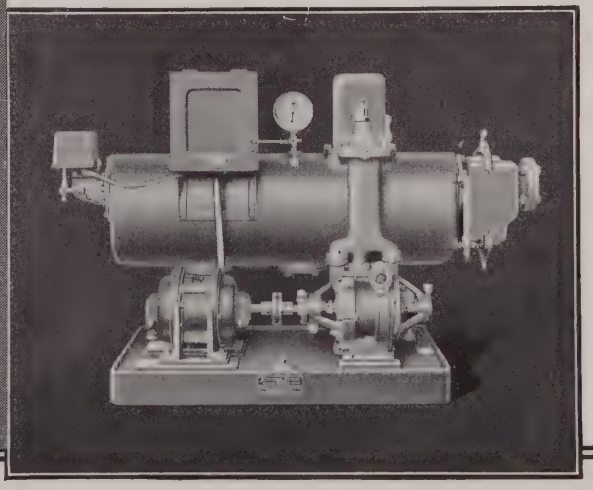
❦ ❦ ❦

Motor-driven Jennings Vacuum Heating Pump is installed on the return line of the vacuum steam heating system in Park Gables.

NEAR the northern city limits of Chicago, surrounding three sides of a fifteen acre park that once divided the lands of the United States from those of the Chippewa, Ottawa, and Pottawatomie tribes, is the Indian Boundary Park Co-operative Apartment Development.

When completed, this project will comprise seven large apartment buildings, containing 327 co-operative homes in one of Chicago's exclusive residential neighborhoods.

A Jennings Vacuum Heating Pump is installed on the heating systems. By helping the radiation respond quickly to varying heating demands, this pump contributes to the comfort of the owner occupants. By enabling the heating systems to serve with substantial savings in boiler fuel, it also is co-operating with the owners in keeping operation within the estimated budget.



Jennings Pumps

THE NASH ENGINEERING CO 12 WILSON ROAD, SOUTH NORWALK CONN.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 150*

FLOORING—Continued

Thomas Moulding Floor Co., 165 W. Wacker Drive, Chicago.
Better Floors. Folder. 4 pp. 11¼ x 13¾ ins. Illustrated. Floors for office, administration and municipal buildings.

Better School Floors. Folder, 4 pp., 11¼ x 13¾ ins. Illustrated.

Characteristics, Specifications and Uses. Brochure. 16 pp. 11¼ x 13¾ ins. Illustrated. Data on floors.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.
Pyrobar Floor Tile. Folder. 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.

Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

U. S. Rubber Co., 1790 Broadway, New York.
Period Adaptations for Modern Floors. Brochure. 8 x 11 ins. 60 pp. Richly illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Ars Ecclesiastica Booklet. 6 x 9 ins. 48 pp. Illustrations of church fitments in carved wood.

Theatre Chairs. Booklet. 6 x 9 ins. 48 pp. Illustrations of theater chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet. 20 pp. 6¼ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.

Kittinger Club and Hotel Furniture. Booklet. 20 pp. 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.

A Catalog of Kittinger Furniture. Booklet, 78 pp., 14 x 11 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh.
Forethought Furniture Plans. Sheets, 6¼ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

New York Galleries, Madison Avenue and 48th Street, New York.
A group of Distinguished Interiors. Brochure, 4 pp., 8¾ x 11¾ ins. Filled with valuable illustrations.

GARAGES

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.

Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.
Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 11 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

Mississippi Wire Glass Co., 220 Fifth Ave., New York.
Mississippi Wire Glass. Catalog. 3⅞ x 8½ ins. 32 pp. Illustrated. Covers the complete line.

GREENHOUSES

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.
Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.

Locks and Builders' Hardware. Bound Volume, 486 pp., 8½ x 11 ins. An exhaustive, splendidly prepared volume.

Colonial and Early English Hardware. Booklet, 48 pp. 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ ins. 8 pp. Illustrated.

McKinney Mfg. Co., Pittsburgh.
Forged Iron by McKinney. Booklet. 6 x 9 ins. Illustrated. Deals with an excellent line of builders' hardware.
Forged Lanterns by McKinney. Brochure, 6 x 9 ins. Illustrated. Describes a fine assortment of lanterns for various uses.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.

Distinctive Elevator Door Hardware. Booklet, 89 pp., 16 x 10½ ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.

HARDWARE—Continued

Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail. Garage Hardware Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins. 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins. 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¼ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside. 4 pp. 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder. 8 pp. 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder. 8 pp. 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago.
Clow Gasteam Vented Heating System. Brochure, 24 pp. 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.
Dunham Radiator Trap. Bulletin 101, 8 x 11 ins. 12 pp. Illustrated. Explains working of this detail of heating apparatus.

Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins. 8 pp. Illustrated. A valuable brochure on valves.

Dunham Return Heating System. Bulletin 109. 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.

Dunham. Vacuum Heating System. Bulletin 110. 8 x 11 ins. 12 pp. Illustrated.

The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure. 8 pp. 8 x 11 ins. Illustrated. Deals with heating for small buildings.

The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure. 12 pp. 8 x 11 ins. Illustrated. Deals with heating for large buildings.

Excelso Products Corporation, 119 Clinton St., Buffalo, N. Y.
Excelso Water Heater. Booklet. 12 pp. 3 x 6 ins. Illustrated. Describing the new Excelso method of generating domestic hot water in connection with heating boilers. (Firepot Coil eliminated.)

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.

Sylphon Heating Specialties. Catalog No. 200. 192 pp. 3½ x 6¾ ins. Important data on heating.

S. T. Johnson Co., Oakland, Calif.
Bulletin No. 4A. Brochure. 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.

Bulletin No. 31. Brochure. 8 pp. 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner With Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog. 8½ x 11 ins. 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.

Catalog No. 78. 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.

Catalog No. 79. 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

May Oil Burner Corp., Baltimore, Md.
Adventures in Comfort. Booklet. 24 pp. 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.

Taking the Quest out of the Question. Brochure. 16 pp. 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet. 3 pp. 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.

McQuay Concealed Radiators. Brochure. 3 pp. 8½ x 11 ins. Illustrated.

McQuay Unit Heater. Booklet. 8 pp. 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Milwaukee Valve Co., Milwaukee, Wis.
MILVACO Vacuum & Vapor Heating System. Nine 4-p. bulletins, 8½ x 11 ins. Illustrated. Important data on heating.

MILVACO Vacuum & Vapor Heating Specialties. Nine 4-p. bulletins. 8½ x 11 ins. Illustrated. Deal with a valuable line of specialties used in heating.

Modine Mfg. Company, Racine, Wis.
Thermodine Unit Heater. Brochure. 24 pp. 8½ x 11 ins. Illustrated. Apparatus for industrial heating and drying.

FOR THE TALL BUILDING

SYLPHON PACKLESS EXPANSION JOINTS ARE **STEAM TIGHT** and FREE FROM JAMMING RISK

Eliminate Story Height Space Wasting "Expansion Loops"

THE dependable Sylphon Bellows as the heart of the Sylphon Packless Expansion Joint provides a continuous yet flexible barrier to steam escape. The Sylphon Packless Expansion Joint easily installed in the vertical riser, allows absolutely no leakage, and operates for years without attention.

It obviates the use of packed or "sliding sleeve" expansion joints almost impossible to repack in the case of a riser concealed in furring.

Far Superior to Joints Stuffed With Commercial Packing

ENDORSED by architects, engineers and contractors, Sylphon Packless Expansion Joints are giving perfect satisfaction in many structures. They make for heating efficiency, save fuel and repair costs. Let us send you details of notable installations, and complete data, sizes, prices and shipping weights.

Your request for information implies no obligation on your part. Correspondence relative to any Sylphon Temperature or Pressure Control Specialty will be welcome. Write for Bulletin F J 100.

THE FULTON SYLPHON COMPANY
KNOXVILLE, TENNESSEE

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 152*

—Continued from page 152

HEATING EQUIPMENT—Continued

Thermodine Cabinet Heater. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Cabinet heaters for buildings of different kinds.

Nash Engineering Company, South Norwalk, Conn.
No. 37. Devoted to Jennings Hytor Return Line Vacuum Heating Pumps, electrically driven, and supplied in standard sizes up to 300,000 square feet equivalent direct radiation.

No. 16. Dealing with Jennings Hytor Air Line Heating Pumps.

No. 17. Describing Jennings Hytor Condensation Pumps, sizes up to 70,000 square feet equivalent direct radiation.

No. 25. Illustrating Jennings Return Line Vacuum Heating Pumps. Size M, for equivalent direct radiation up to 5,000 square feet.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet. 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 27 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Heating Homes the Modern Way. Booklet, 8½ x 11¾ ins. Illustrated. Data on the Petro Burner.

Residence Oil Burning Equipment. Brochure, 6 pp., 8½ x 11 ins. Illustrated. Data regarding Petro Burner in a bulletin approved by Investigating Committee of Architects and Engineers.

Oil Heating Institute, 420 Madison Ave., New York.
What about the Supply of Oil Fuel? Booklet, 16 pp., 5½ x 8 ins. Illustrated.

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Petro Mechanical Oil Burner & Air Register. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Data on industrial installations of Petro Burners.

Present Accepted Practice in Domestic Oil Burners. Folder, 4 pp., 8½ x 11 ins. Illustrated. A reprint from Heating and Ventilating Magazine.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.
Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Tempervane Heating Units, Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.
Bulletin 14. 16 pp. 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.

Bulletin 20. 24 pp. 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.

How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 24th St. and Tenth Ave., New York City.
Catalog 426. 7 x 10 ins. 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

Holophane Company, 342 Madison Avenue, New York.
Lighting Specific for Hospitals. Booklet, 29 pp. 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet. 8½ x 11½ ins. 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

The Pick-Barth Companies, Chicago and New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 21 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Wilmot Castle Company, Rochester, N. Y.
Sterilizer Equipment for Hospitals. Book, 76 pp., 8½ x 11 ins. Illustrated. Gives important and complete data on sterilization of utensils and water, information on dressings, etc.

Sterilizer Specifications. Brochure, 12 pp., 8½ x 11 ins. Practical specifications for use of architects and contractors.

Architects' Data Sheets. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Information on piping, venting, valving and wiring for hospital sterilizer installations.

Hospital Sterilizing Technique. Five booklets. 8 to 16 pp. 6 x 9 ins. Illustrated. Deals specifically with sterilizing instruments, dressings, utensils, water, and rubber gloves.

HOTEL EQUIPMENT

Pick & Company, Albert, 208 West Randolph St., Chicago, Ill.
Some Thoughts on Furnishing a Hotel. Booklet. 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins. inside. Illustrated. Incinerator sanitation equipment for residence use.

INCINERATORS—Continued

A. I. A. File. 12 pp., 8¾ x 10¾ ins. inside. Suggestions for architect on incineration, showing installation and equipment.

Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins. inside, illustrated. A complete outline of the many advantages of incineration.

Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins. inside. Illustrated, explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins. 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

Sanitary Elimination of Household Waste, booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.

Garbage and Waste Disposal for Apartment Buildings, folder, 8½ x 11 ins. 16 pp. Illustrated. Describes principle and design of Kernerator-Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.

Sanitary Disposal of Waste in Hospitals. Booklet. 4 x 9 ins. 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.

The Kernerator (Chimney-fed) Booklet. Catalog No. 17. 20 pp. 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATING LUMBER

Masonite Corporation, 111 West Washington St., Chicago, Ill.
Booklet, 12 pp., 8½ x 11 ins. Illustrated. Gives complete specifications for use of insulating lumber and details of construction involving its use.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins. 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.

Insulation of Roofs to Prevent Condensation. Illustrated booklet. 7½ x 10½ ins. 36 pp. Gives full data on valuable line of roof insulation.

Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.

"The Cork Lined House Makes a Comfortable Home." 5 x 7 ins. 32 pp. Illustrated.

Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Insulating Quilt. Booklet. 7½ x 10½ ins. 24 pp. Illustrated. Deals with a valuable type of insulation.

Structural Gypsum Corporation, Linden, N. J.
Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.
Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

Genfire Steel Company, Youngstown, Ohio.
Steel Joists. 8½ x 11 ins. 32 pp. A. I. A. File Number 13G. Illustrated. Complete data on T-Bar and Plate-Girder joists, including construction details and specifications.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, restaurants and Cafeteria Applications of Monel Metal. Booklet. 8½ x 11 ins. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeteria Portfolio. 17 x 11 ins. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.

School Cafeterias. Booklet. 9 x 6 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York.
Hand Wrought Lanterns. Booklet, 5¼ x 6¼ ins. 20 pp. Illustrated in Black and White. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

Home of Mr. Earle W. Vinnedge, Wyoming, Ohio, insulated with 1½ inches Armstrong's Corkboard on the walls and 2 inches on the roof.

Gas Bill 42% Less *in this* Cork-lined House

IT is not at all unusual for a home owner to find, after he has lined his new home with Armstrong's Corkboard, that the added comfort and the fuel saving are even greater than he had been led to expect. The following letter from Mr. Earle W. Vinnedge, of Wyoming, Ohio, is a typical illustration:

"The deciding factor in my choice of your corkboard was the anticipated saving of fuel during the winter months. At the time of our discussion as to its merits, you advised that I could reasonably expect saving of about 35% in fuel costs, providing the proper type of heater was installed. This saving has been actually much greater than estimated and I find that my first winter's results represent a saving of about 42% over the average fuel used for an uninsulated house the size of mine. These results have been obtained from the Commercial Department of the Union Gas & Electric Company of Cincinnati.

"My home has been made more comfortable to live in both summer and winter and all of your statements, which were considered somewhat extravagant, have more than proved themselves."

If you haven't a copy of Armstrong's catalog and specification book in your files, send for one at once. It contains much valuable data on the use and performance of Armstrong's Corkboard in residence construction. Address Armstrong Cork & Insulation Company, 132 Twenty-fourth Street, Pittsburgh, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto 2.

Armstrong's Corkboard Insulation

for the Roofs of All Kinds of Buildings

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 154*

LATH, METAL AND REINFORCING

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 ins. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone. Rigid Metal Lath and interior plastering.

National Steel Fabric Co., Pittsburgh.
Better Walls for Better Homes. Brochure. 16 pp. 7¾ x 11¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder. 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅛ x 7⅜ ins. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative examples.

LAUNDRY MACHINERY

American Laundry Machinery Co., Norwood Station, Cincinnati, Ohio.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.

LIBRARY EQUIPMENT

Art Metal Construction Co., Jamestown, N. Y.
Planning the Library for Protection and Service. Brochure. 52 pp. 8½ x 11 ins. Illustrated. Deals with library fittings of different kinds.
Library Bureau Division, Remington Rand, N. Tonawanda, N. Y. Like Stepping into a Story Book. Booklet. 24 pp. 9 x 12 ins. Deals with equipment of Los Angeles Public Library.

LIGHTING EQUIPMENT

The Frink Co., Inc., 24th St. and 10th Ave., New York City.
Catalog 415, 8½ x 11 ins. 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York.
The Lighting of Schools; A Guide to Good Practice. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp. 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp. 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet. 24 pp. 8½ x 11 ins. Illustrated.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York.
Lighting Fixtures, Lamps and Candlesticks. 24 pp. 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rorchester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ ins. 8 pp. Illustrated.

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New Booklet. 24 pp., 5¼ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga., New York Office, 1328 Broadway.
Why Georgia Marble is Better. Booklet. 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅜ x 6 ins. 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

MARBLE—Continued

Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp. 8½ x 11 ins. Details.

METALS

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet, 6¼ x 3 ins. 166 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book. 9 x 11½ ins. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII incl. Booklet. 9 x 12 ins. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19½ x 23½ ins. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog, 7½ x 10 ins. 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.
The Pergola Catalog. 7½ x 10 ins. 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 183 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder. 8½ x 11 ins. 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.

MORTAR AND CEMENT COLORS

Color Card. 6½ x 3¼ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something new in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco-coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York.
A book of Old English Designs. Brochure. 47 plates. 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume. 183 plates. 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet. 23 plates. 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains. Booklet. 4 x 8½ ins. 16 pp. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins. 100 pp. Gives directions and formulae for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet, 6¼ x 3½ ins. 16 pp. Illustrated. Directions and formulae for painting metals.
Came Lead. Booklet, 8¾ x 6 ins. 12 pp. Illustrated. Describes various styles of lead cames.

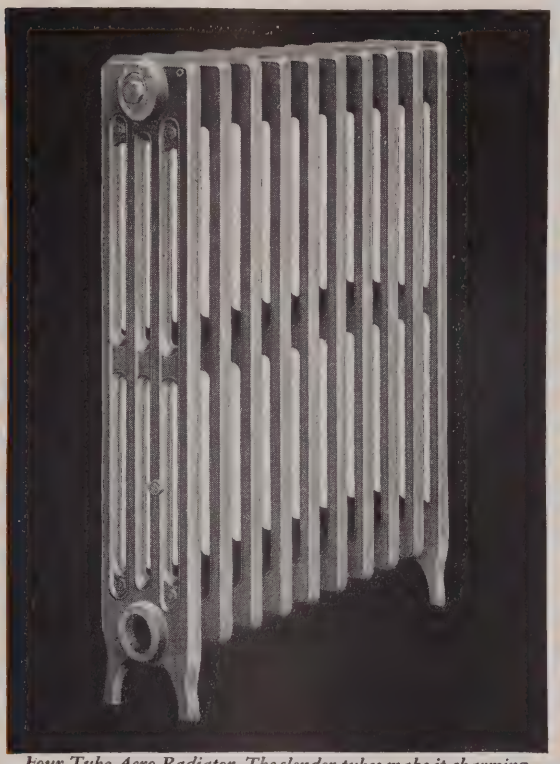
Pratt & Lambert, Inc., Buffalo, N. Y.
Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 ins. 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.
Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2, 8½ x 11 ins. 12 pp. Illustrated. Thorough discussion, including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.
Painting and Decorating of Interior Walls. Bulletin No. 3. 8½ x 11 ins. 20 pp. Illustrated. An excellent reference book on Flat Wall Finish, including texture effects, which are taking the country by storm. Every architect should have one on file.
Protective Paints for Metal Surfaces. Bulletin No. 4. 8½ x 11 ins. 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Avenue., New York.
Paint Specifications. Booklet, 8½ x 10¾ ins. 4 pp.

U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

Valentine & Co., 456 Fourth Ave., New York.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 ins. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 23 pp., 7 x 8½ ins. A useful work on the upkeep of residences.
Architectural Four-Hour Varnishes and Enamels. Booklet, 8 pp., 4½ x 6 ins. Data on a useful line of materials.



Four Tube Aero Radiator. The slender tubes make it charming and efficient; provide the scientifically correct ratio of air space to heating area.

Three Tube Aero Radiator. Graceful, and pleasing, it is particularly adapted to narrow corridors, and rooms where space is at a premium.

Five Tube Aero Radiator. This model finds its field of use in all general applications: Homes, schools, apartments, offices and everywhere.

Six Tube Aero Radiator. Provides an unusual amount of radiating surface, but being only nine inches wide takes up very little space.

Seven Tube Aero Radiator. A unit with tremendous warming capacity which is used where space limitations will not permit a long radiator.

THE RADIATOR THAT SET NEW STANDARDS~~~

Aero, the National Radiator, was the first to successfully combine beauty and efficiency, and revolutionized the cast iron radiator industry. Aero created a new appreciation of what radiators should be. Aero pioneered in standardization, introducing—in five models—a type and style for every application. For more than six years, Aero, the National Radiator, has led the field consistently. Imitated and followed, today it is the only tube type radiator whose value and dependability have been proven over a period of years in all types of buildings all over the nation. Aero, a National Product, is the National Radiator.

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MANUFACTURER OF RADIATORS AND BOILERS

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Baltimore, Md.—2600-2622 Matthews St. Boston, Mass.—93-97 Oliver St. Buffalo, N. Y.—259-265 Delaware Ave.
Chicago, Ill.—2445 N. Keeler Ave. Cleveland, Ohio—935 E. 63rd St.
Cincinnati, O.—3530-36 Spring Grove Ave. Indianapolis, Ind.—431 W. Georgia St. Johnstown, Pa.—221 Central Ave.
Milwaukee, Wis.—124-130 Jefferson St. New York, N. Y.—55 W. 42nd St.
Omaha, Neb.—108-112 S. Tenth St. Philadelphia, Pa.—121 N. Broad St. Pittsburgh, Pa.—1509 Arrott Bldg.
Richmond, Va.—3032 Norfolk St. St. Louis, Mo.—1042 Central Industrial Ave.
Washington, D. C.—2205 Fifth St., N. E.

AERO THE NATIONAL RADIATOR

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 156*

PAPER

A. P. W. Paper Co., Albany, N. Y.
"Here's a Towel Built for Its Job." Folder, 8 pp., 4 x 9 ins. Deals with "Onliwon" paper towels.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.
Architects' Portfolio. Booklet, 12 pp. 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.
Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ ins. 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog. 8¼ x 11 ins. 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions. cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for erecting Telesco Partitions. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet. 7 x 10 ins. 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush door partitions.

U. S. Gypsum Co., Chicago.
Pyrobar Partition and Furring Tile. Booklet. 8½ x 11 ins. 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1. Brass Pipe for Water Service. 8½ x 11 ins. 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.
How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "A." 4 x 16½ ins. 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.
Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Inc., Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fillings. Booklet, 20 pp., 8½ x 11 ins., illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins. 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins. 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deaerating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins. 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp. 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.
Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

C. F. Church Mfg. Co., Holyoke, Mass.
Catalog S. W.-3. Booklet, 95 pp., 7¾ x 10½ ins. Illustrated. Data on Sani-White and Sani-Black toilet seats.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "M." 9¼ x 12 ins. 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

PLUMBING EQUIPMENT—Continued

Crane Company, 836 S. Michigan Ave., Chicago, Ill.
Plumbing Suggestions for Home Builders. Catalog. 3 x 6 ins. 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog. 4 x 6½ ins. 34 pp. Illustrated.
Planning the Small Bathroom. Booklet. 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.
Douglas Plumbing Fixtures. Bound Volume. 200 pp. 8½ x 11 ins. Illustrated. General catalog.
Another Douglas Achievement. Folder. 4 pp. 8½ x 11 ins. Illustrated. Data on new type of stall.
Hospital. Brochure. 60 pp. 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog "K." 10⅞ x 7⅞ ins. 242 pp. Illustrated. Complete data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.
The Blue Book of Plumbing. Bound volume. 181 pp. 8½ x 10½ ins. Illustrated.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¼ ins. 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

The Trane Co., LaCrosse, Wis.
Trane Small Centrifugal Pumps. Booklet. 3¾ x 8 ins. 16 pp. Complete data on an important type of pump.

Weil Pump Co., 215 W. Superior St., Chicago.
Pumps. Booklet, 8½ x 11 ins. Illustrated. Individual bulletins with specifications on sewage ejectors, and bilge, house, condensation, booster and boiler feed pumps.

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.
Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.
Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

REINFORCED CONCRETE—See also Construction, Concrete

Genfire Steel Company, Youngstown, Ohio.
Self-Centering Handbook. 8½ x 11 ins. 36 pp. Illustrated. Methods and specifications on reinforced concrete floors, roofs and floors with a combined form and reinforced material.

Truscon Steel Company, Youngstown, Ohio.
Shearing Stresses in Reinforced Concrete Beams. Booklet. 8½ x 11 ins. 12 pp.

North Western Expanded Metal Company, Chicago, Ill.
Designing Data. Book. 6 x 9 ins. 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

ROOFING

The Barrett Company, 40 Rector St., New York City.
Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure. 63 pp. 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Bird & Son, Inc., E. Walpole, Mass.
Bird's Roofs. Folder, 16 pp., 3½ x 6 ins. Illustrated. Data of roofing materials.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver.
Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.
Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.
Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and southern California.
Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

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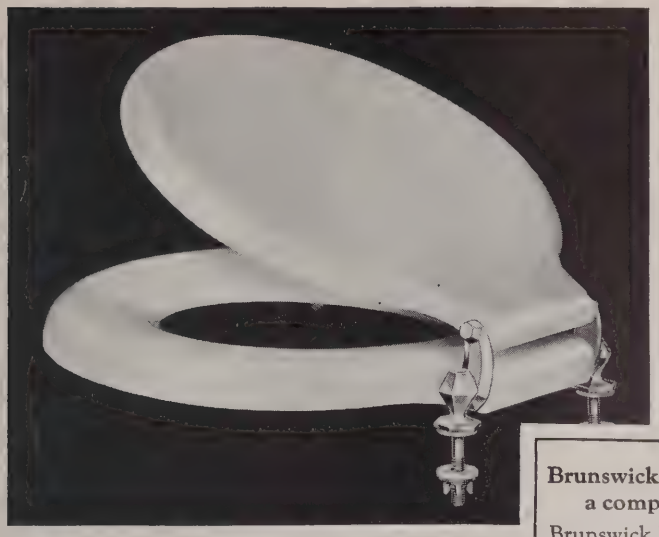

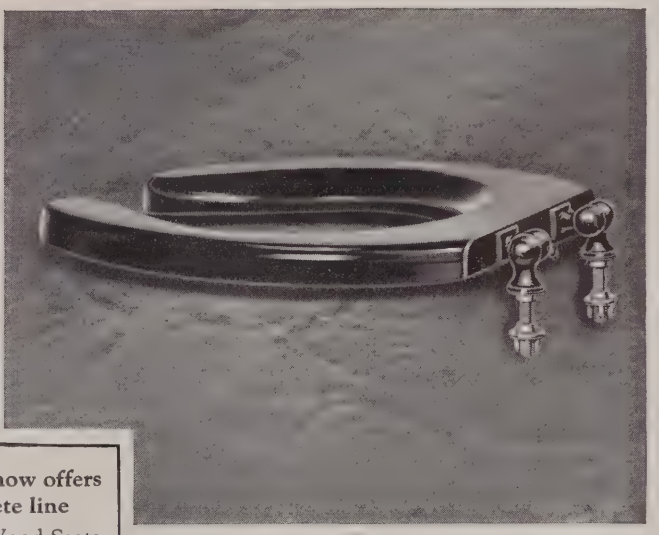

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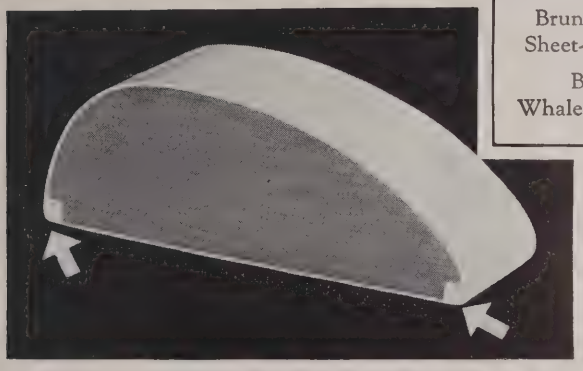

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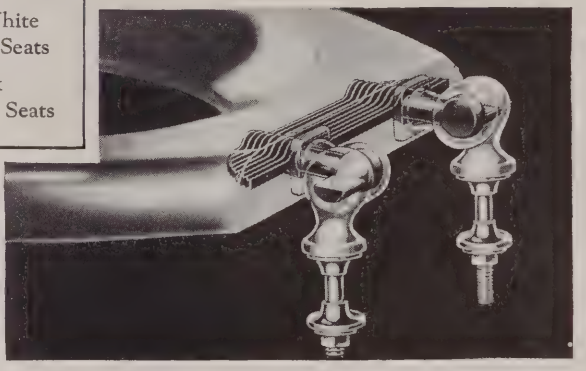

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 158*

ROOFING—Continued

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet. 8½ x 11 ins. 4 pp. Illustrated. For architects who desire something out of the ordinary, this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Roof Construction. Booklet. 8 x 11 ins. 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.

Sheetrock Pyrofill Roof Construction. Folder. 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets. 7¾ x 10¼ ins. 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

SCREENS

American Brass Co., The, Waterbury, Conn.
Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.
Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8⅝ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SOUND DEADENER

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Deadening Quilt. Brochure, 7½ x 10½ ins., 28 pp. Illustrated. Gives complete data regarding a well-known protection against sound.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 ins. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone.
Rigid Metal Lath and interior plastering.
Fireproofing Handbook. 8½ x 11 ins. 32 pp. Illustrated. Describes the full line of products manufactured by the Genfire Steel Company.

Steel Frame House Company, Pittsburgh. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp. 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp. 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp. 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 ins. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.

STONE, BUILDING—Continued

Vol. 4. Series B. Booklet. New Edition. 8½ x 11 ins. 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio. 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6, Series B—Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pages. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Avenue, Chicago, Ill.
Catalog No. 31. Series 500. All-Copper Construction. Illustrated brochure. 20 pp. 8½ x 11 ins. Deals with store fronts of a high class.
Brasco Copper Store Fronts. Catalog No. 32. Series 202.
Brasco Standard Construction. Illustrated brochure. 16 pp. 8½ x 11 ins. Complete data on an important type of building.
Detail Sheets. Set of seven sheets; printed on tracing paper, showing full sized details and suggestions for store front designing, enclosed in envelope suitable for filing. Folds to 8½ x 11 ins.
Davis Solid Architectural Bronze Sash. Set of five sheets, printed on tracing paper, giving full sized details and suggestions for designing of special bronze store front construction, enclosed in envelope suitable for filing. Folds to 8½ x 11 ins.

The Kawneer Company, Niles, Mich.
Store Front Suggestions. Booklet, 96 pp., 6 x 8½ ins. Illustrated. Shows different types of Kawneer Solid Copper Store Fronts.
Catalog K. 1927 Editon. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Details of Kawneer Copper Store Fronts.
Detail Sheets for Use in Tracing. Full-sized details on sheets 17 x 22 ins.
Kawneer Construction in Solid Bronze or Copper. Booklet, 64 pp., 8½ x 11 ins. Illustrated. Complete data on the subject.

Modern Bronze Store Front Co., Chicago Heights, Ill.
Introducing Extruded Bronze Store Front Construction. Folder. 4 pp., 8½ x 11 ins. Illustrated. Contains full sized details of metal store fronts.

Zouri Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog. 8½ x 10½ ins. 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.

International Store Front Construction. Catalog. 8½ x 10 ins. 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure. 8½ x 11 ins. 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.

Color in Architecture. Revised. Edition. Permanently bound volume, 9⅛ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.

Present Day Schools. 8½ x 11 ins. 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.

Better Banks. 8½ x 11 ins. 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 ins. 32 pp. Illustrated. A treatise on the subject of hollow tile wall construction.
Standard Fireproofing Bulletin 171. 8½ x 11 ins. 32 pp. Illustrated. A treatise on the subject of hollow tile as used for floors, girder, column and beam covering and similar construction.
Natco Double Shell Load Bearing Tile Bulletin. 8½ x 11 ins. 6 pp. Illustrated.
Natco Uninbacker Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natcoflor Bulletin. 8½ x 11 ins. 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.

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Kraftile Company, 55 New Montgomery St., San Francisco.
High Fired Faience Tile. Booklet. 32 pp. 8½ x 11 ins. Illustrated. Presents a fine line of tiles for different purposes.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

Medical Center

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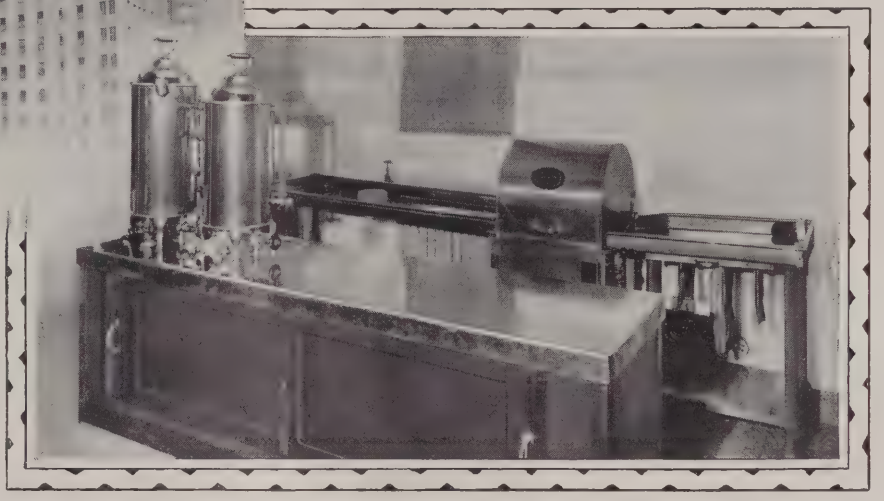

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Clarence Drucker, 307 Minna St., San Francisco, Cal.
L. C. Coombs, 1010 North Gardner St., Los Angeles, Cal.
Richard O'Brien, 524 22nd St., North, Seattle, Wash.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 160*

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago.
The Dunham Packless Radiator Valve Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Bros., 80 White St., New York.
The Valve Behind a Good Heating System. Booklet. 4½ x 7¼ ins. 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet. 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet. 7 x 10 ins., 24 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 ins. Data on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder. 8 x 10½ ins. 8 pp. Data regarding fans for ventilation of laboratory fume hoods.
Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Globe Ventilator Company, 205 River St., Troy, N. Y.
Globe Ventilators Catalog. 6 x 9 ins. 32 pp. Illustrated profusely. Catalog gives complete data on "Globe" ventilators as to sizes, dimensions, gauges of material and table of capacities. It illustrates many different types of buildings on which "Globe" ventilators are in successful service, showing their adaptability to meet varying requirements.

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet. 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dustproofing and hardening concrete floors, and accelerating the setting of concrete. Free distribution.

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.
Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Sommers & Co., Ltd., 342 Madison Ave., New York City.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Pamphlet. 3¼ x 8¼ ins. 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

The Vortex Mfg. Co., 1978 West 77th St., Cleveland, Ohio.
Par-Lock Specification "Form D" for waterproofing surfaces to be finished with Portland cement or tile.
Par-Lock Specification "Forms E and G" membrane waterproofing of basements, tunnels, swimming pools, tanks to resist hydrostatic pressure.
Par-Lock Waterproofing. Specification Forms D, E, F and G. Sheets, 8½ x 11 ins. Data on combinations of gun-applied asphalt and cotton or felt membrane, built up to suit requirements.
Par-Lock Method of Bonding Plaster to Structural Surfaces. Folder, 6 pp. 8½ x 11 ins. Official Bulletin of Approved Products,—Investigating Committees of Architects and Engineers.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet. 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 162*

WINDOWS

The Kawneer Company, Niles, Mich.
Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8⅝ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

Crittall Casement Window Co., 10951 Hearn Ave., Detroit, Mich.
Catalog No. 22. 9 x 12 ins. 76 pp. Illustrated. Photographs of actual work accompanied by scale details for casements and composite steel windows for banks, office buildings, hospitals and residences.

Genfire Steel Company, Youngstown, Ohio.
Architectural Details, Casement Windows and Doors. 8½ x 11 ins. 28 pp. A. I. A. File No. 16e. Specifications and construction details.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog. 12¼ x 18½ ins. 30 pp. Illustrated. Full size details of outward and inward opening casements.

The Kawneer Company, Niles, Mich.
Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 20 pp. 8⅝ x 11 ins. Illustrated brochure on casements, particularly for residences.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.
Architectural Details. Booklet. 8½ x 11 ins. 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet. 8½ x 11 ins. 16 pp. Full lists of parts for different units.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

WINDOWS, STEEL AND BRONZE

Genfire Steel Company, Youngstown, Ohio.
Architectural Details, Steel Pivoted, Commercial and Architectural Projected Windows. 8½ x 11 ins. 24 pp. A. I. A. File No. 16e. Specification and construction details.

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅝ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.
How Windows Can Make Better Homes. Booklet. 3⅞ x 7 ins. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book. 8½ x 11 ins. 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.
Truscon Solid Steel Double-Hung Windows. 24 pp. Booklet. 8½ x 11 ins. Containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.
Continuous Steel windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.
American Walnut. Booklet. 7 x 9 ins. 45 pp. Illustrated. A very useful and interesting little book on the use of Walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.
"American Walnut for Interior Woodwork and Paneling." 7 x 9 ins. Pages illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.
Better Built Homes. Vols. XV-XVIII, incl. Booklet. 9 x 12 ins. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects, for the Curtis Companies.

National Lumber Mfrs. Assn., Washington.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.

Dominating the sky-line of New York's Grand Central Zone, the new 56-story $12,000,000 Chanin Building brings another Barrett Roof to a neighborhood in which *these* roofs are conspicuously numerous. This picture shows many of the best known structures in this famous area—roofed and protected by *Barrett:*

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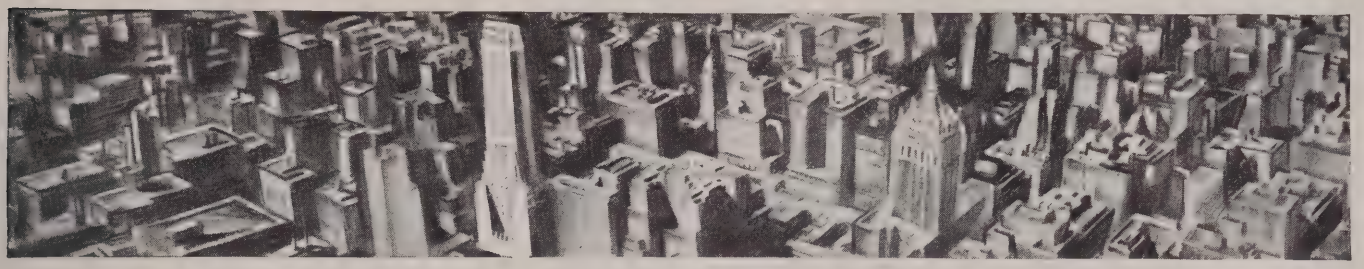
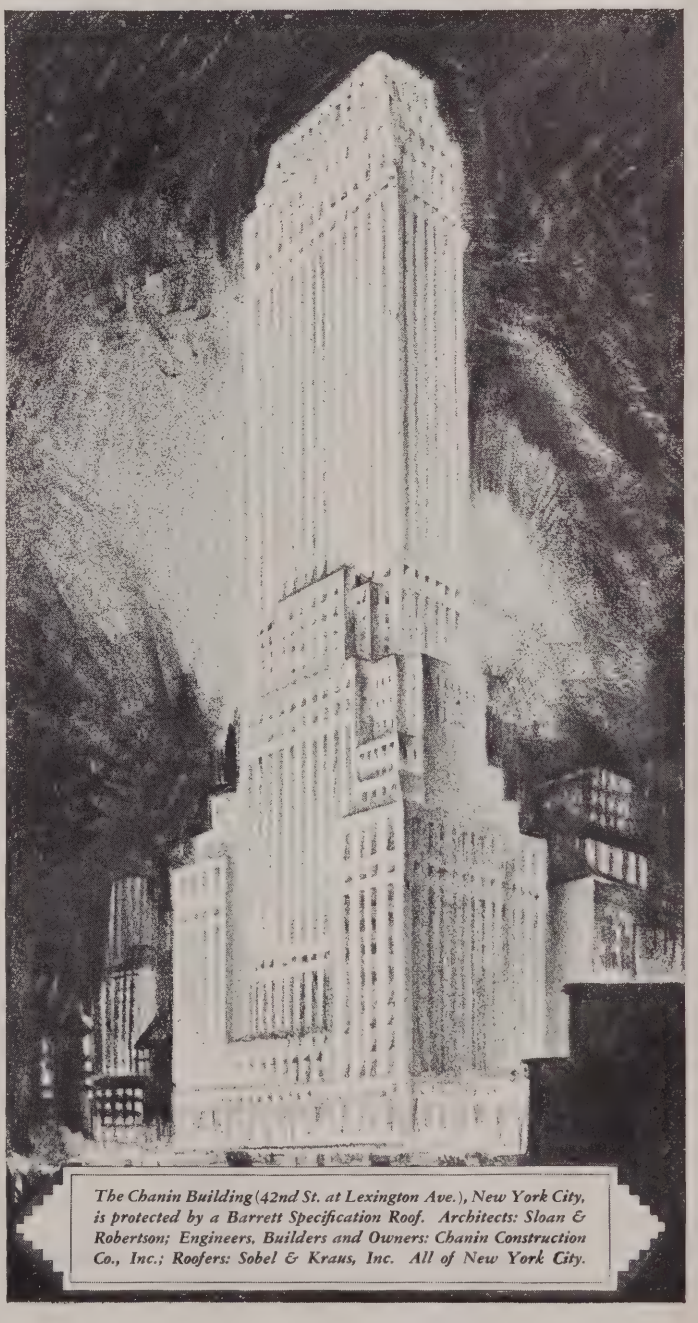


Another towering tribute to Barrett Specification Roofs



The Chanin Building (42nd St. at Lexington Ave.), New York City, is protected by a Barrett Specification Roof. Architects: Sloan & Robertson; Engineers, Builders and Owners: Chanin Construction Co., Inc.; Roofers: Sobel & Kraus, Inc. All of New York City.

NOSING 670 feet upward into the thinner atmospheres, the great shaft-like Chanin Building, topped with a Barrett Specification Roof, takes its rank as New York's third loftiest skyscraper—and the Chanin brothers' most outstanding achievement.

Standards in architecture have changed. But *one* standard, a roofing practice of leading architects for many years, continues to *carry on.*

Just as the other two members of the "big three"—the 792 foot Woolworth Building (1913) and the Metropolitan Life Building (1890), with its 700-foot tower—are protected by Barrett Roofs, so too will this *newest* comer depend on Barrett Coal-Tar Pitch and Felt and gravel—*a Barrett Specification 20-Year Bonded Roof.* A roof that guarantees the owner against repair and upkeep expense for a full 20 years.*

The owners and architects chose a Barrett Specification Roof, which was approved by the investment bankers, S. W. Straus & Co. For they *knew* the records of this roof—they knew that Barrett Specification Roofs, though bonded only for 20 years, are still serving hundreds of old-timers, buildings erected way back in the *70's* and *80's*—still "licking" the weather and defeating expense.

This knowledge, together with the high reputation of Barrett Approved Roofers, cooperating on every job with Barrett inspectors, checking every step of the work, is responsible for this newest Barrett application in a neighborhood of *many* Barrett Roofs.

*The Barrett Company also offers a Specification Type "A" Roof which is bonded for 10 years. This type of roof is adaptable to a certain class of buildings. The same high-grade materials are used, the only difference being in the quantities.

THE BARRETT COMPANY

40 Rector Street New York City

IN CANADA:

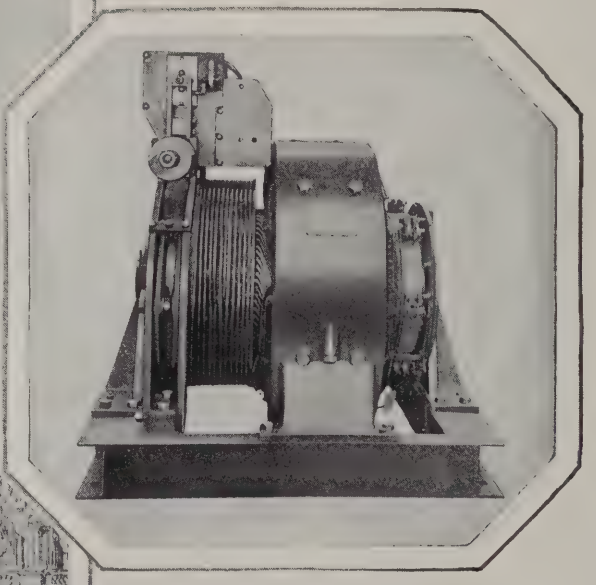
The Barrett Company, Limited, 5551 St. Hubert St., Montreal, Quebec

4

Williamsburg Savings Bank Building, Brooklyn, N.Y. Elevator equipment supplied by Gurney Elevator Company

Architects—Halsey, McCormack & Helmer

Consulting Engineer—Frank Sutton



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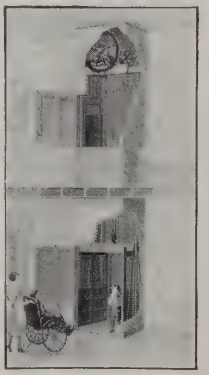

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Grant Building, Henry Hornbostel, Architect Thompson Starrett Co., Contractors

IN Pittsburgh's Golden Triangle, so called because of this city's concentrated business district at the point where the Allegheny and Monongahela rivers form the Ohio, business expansion has necessitated the erection of a number of buildings which are outstanding examples of modern construction and equipment. With heights ranging up to forty stories, these buildings must have elevator service as modern as the structures themselves.

Swift, safe, sure, the automatic inductor control, as designed by Westinghouse, is the latest and best for elevator operation. The control is automatic—good service does not depend upon the skill of the operator. The motion is smooth at all times. There is no jockeying at floor landings, and passengers are never required to step up or down—the car always stops level with the floor.

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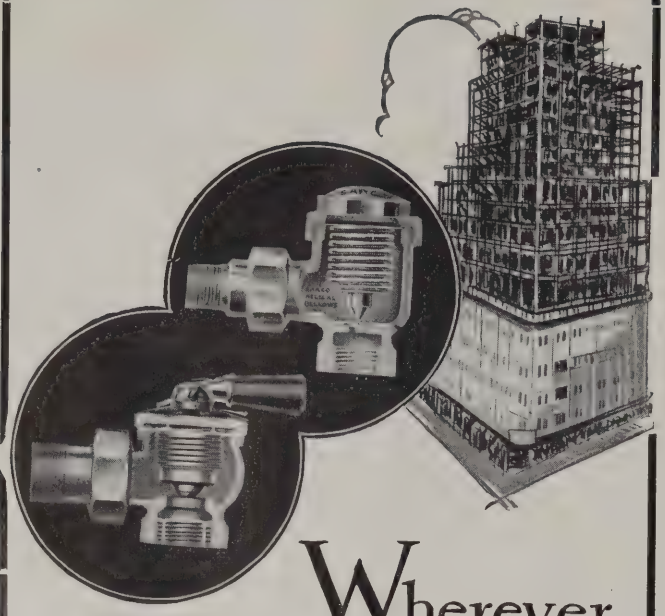

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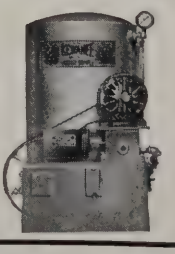
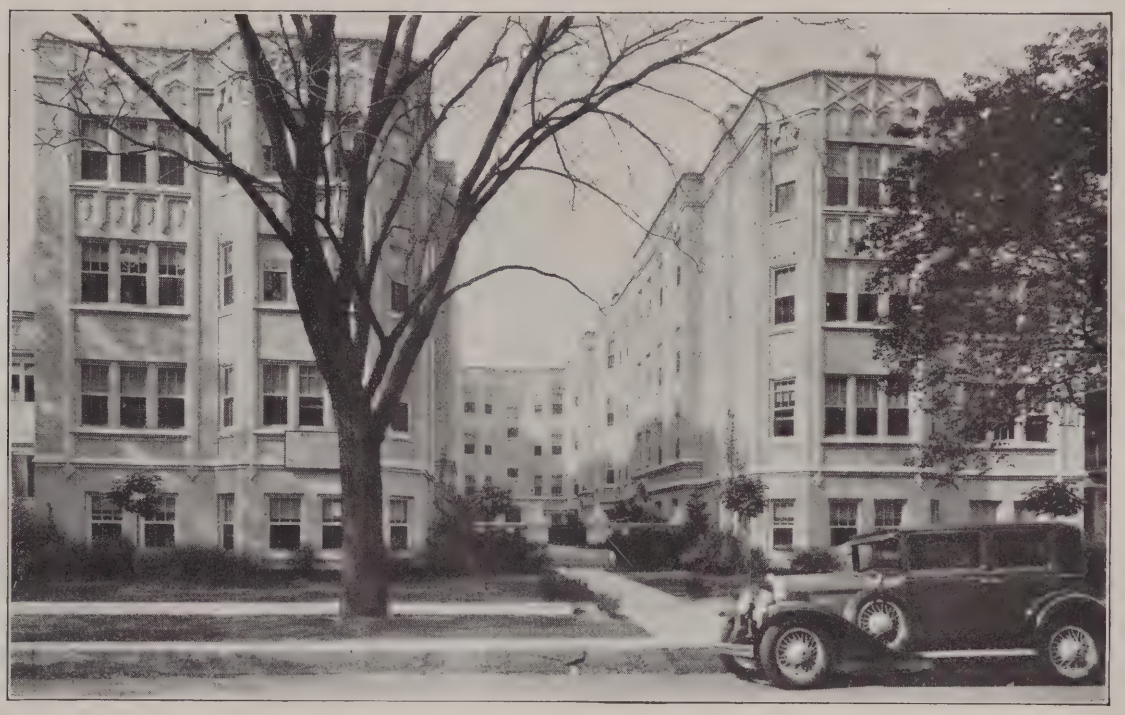
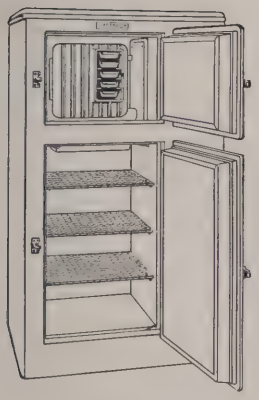


ELECTROLUX VINDICATES *the* ARCHITECT'S JUDGMENT



Fred Anderson Apartments on Judson Avenue, Evanston, Illinois. Equipped with Electrolux Refrigerators.

Read why this architect chose the Gas Refrigerator as ideal for apartment house installation



Chef Model Electrolux... 7 cubic feet food space. This convenient size is installed in the new apartment dwelling pictured above.

ELECTROLUX vindicates the architect's judgment in selecting it. The gas refrigerator makes apartments easier to rent. The economy of gas is well known, and the total absence of moving parts in Electrolux insures absolute silence, long life and freedom from servicing.

That's why the architect of this handsome new apartment dwelling in Evanston, Illinois, chose Electrolux.

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This amazing refrigerator freezes by the heat from a tiny gas flame. It has no moving, wearing parts . . . no motor, compressor, pump, fan, belt . . . nothing to need oiling or replacement. Engineers see no reason why Electrolux should ever wear out . . . why it should not last as long as the building. The freezing unit is hermetically sealed at the factory and never needs renewal or replacement.

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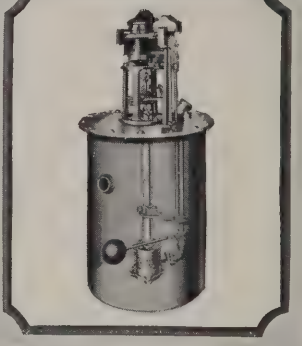

Fig. NGR–2001. "Weil" Type NRG Condensation Pump and Receiver. Occupies small space. Concrete pit unnecessary.

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